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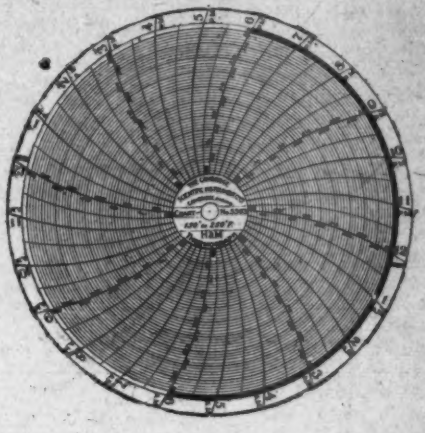

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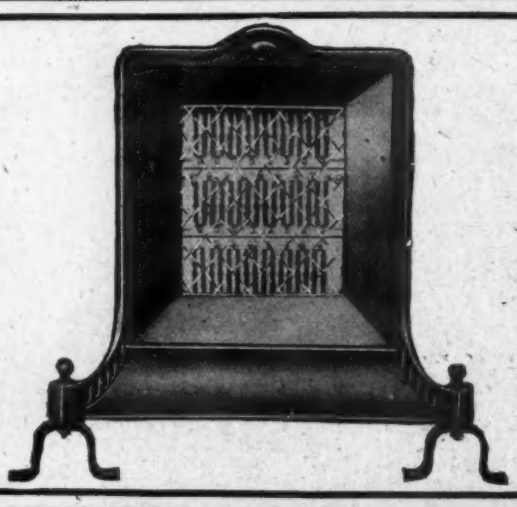

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THE
ELECTRICAL REVIEW.

VOL. LXXXI. OCTOBER 12, 1917. No. 2,081.

ELECTRICAL REVIEW.

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THE IMPORTANCE OF INDUSTRIAL INFORMATION.

IN his recent speech to the Library Association, Dr. Addison, the Minister for Reconstruction, clearly indicated that he appreciated the importance of the ample provision of serviceable industrial information for the use of men who are competent in a particular business. Trade and technical journalists who, through good and bad report, have made this their specialised vocation may welcome this recognition of their service by those who are leading in the work of preparation for a period of efficient reconstruction. During the past three years, when the country "has been handicapped to a tragical degree by the absence of necessary scientific and industrial information of a serviceable kind," the technical and trade journals have been enabled to play a more important part in the national organisation than was ever before their privilege. Those which have been directly dealing with the electrical, engineering, and other munitions industries which have been serving the national purposes in "an engineer's war," know well enough how valued their assistance has been by thousands of professional men and by hundreds of thousands of other workers, not only when given in the form of published articles, but also in the form of private correspondence in which funds of expert information have been freely drawn upon by the editor and imparted to the inquirer. This may be described as direct national service helping materially in the efficient and expeditious equipment of works, the installation and running of plant, and speeding up the output of munitions of war. In addition to this, as our own experience has shown, established journals have been turned to not once or twice, but hundreds of times by those in Government Departments who knew where they could ascertain essential information which was not in the archives of our pre-war Governmental intelligence departments. The large number of men of technical qualifications and industrial and commercial experience who, leaving their private callings, have taken up employment on war service in some department or other requiring their specialised knowledge and abilities, have known just where to put their hands on the trade journal editor who could help them, and this information, passed on by them to permanent civil service officials, has raised the prestige of the specialised organs very materially both in the present and for the future. It may still be felt that the usefulness of this branch of service has not been adequately recognised by some in high authority, but the fact remains that one of the best servants of the State, working more or less silently and often quite unobtrusively, though always most eagerly, has been the technical Press.

Dr. Addison, in his speech, showed that in order to pay for the war it is necessary for the different trades and industries of the Allies to organise more and more for the production and dissemination of useful and necessary information. He urged the great trades to take up the question of promoting scientific research in particular industrial processes, and in this connection he considered that the public libraries could perform valuable work by placing information useful to the industries of various districts, at the disposal of the communities in those districts. Here it will be recognised that the technical

and trade Press and books have an important function to fill. We believe we are correct in stating that technical books relating to all matters having any bearing on war productions have been in enormous demand during the war, and the needs of the future, when technical study and manufacturing are able to return to a more normal course, will be very considerable. Nothing can supersede the work of the competent author of all kinds of technical literature. This point was recognised by other speakers at the meeting of the Library Association, which had before it several resolutions dealing with the establishment of commercial and technical libraries. Mr. MacAlister remarked that while commercial libraries were quite a recent development, we had always had technical libraries in some form. He suggested, however, that they needed to be developed in several directions to become efficient aids to the arts and manufactures of this country. He mentioned that the possibilities of the technical library in aiding research, discovery, and invention had never been fully realised in England; we fully agree with this statement, which we commend to the notice of British manufacturers.

In how many engineering works in this country will be found a library of technical books, selected under competent advice, and comprising the best and most up-to-date treatises and works of reference bearing upon the particular branch of industry concerned? Where such a library exists, are its resources available to the technical staff, the designers and draughtsmen, and the accountants of the establishment, or are they locked up in the manager's room and jealously withheld from the hands of his subordinates? There may be on a shelf in the D.O. a few well-thumbed and dilapidated old friends such as Unwin's "Machine Design," Rankine's "Civil Engineering," and so on, but these only serve to emphasise the lack of an adequate modern reference library; and even if the books were there, would the draughtsmen be permitted to consult them freely and often, without incurring reproof for "slacking"?

It is our contention that in every such establishment a well-equipped technical library should be provided and carefully kept up to date, and that the engineering staff should be encouraged to make full use of it in the performance of their duties. The provision of duplicate copies of standard works, to be lent to the men for home study, would also be a wise procedure, and would abundantly repay the cost, comparatively trifling to the firm, but prohibitive to the junior members of the staff. The example of the Institution of Electrical Engineers, which has added to its magnificent collection of books a lending library for the use of its members, is well worthy of emulation; the system has proved highly successful, many hundreds of books being borrowed each year.

An Electroculture Committee.

During the past year or two considerable attention has been given in this country to the possibilities of electroculture in the shape of increased and improved crop production, and, in addition to the recognised experimental stations, many more or less experienced investigators have installed apparatus with a view to personally exploring what has for many years been an attractive, though little known, branch of electrical science. The war has undoubtedly been responsible for the sudden accession of interest in this subject, as in agriculture generally, but it has also added to the difficulties naturally attendant on such a situation. We have, for instance, often felt, and privately urged, that adequate steps should be taken to secure (1) co-ordination of effort amongst those engaged in these experiments, (2) that any necessary knowledge gained by past experience in the operation of such installations should be in the possession of all investigators, and (3) that the results obtained and all essential data connected with the year's work should in every case be tabulated, so that they can readily be utilised in the interests of future progress. The case is distinctly one where the co-operation of all directly concerned will advance matters in the national interest, and for this reason the movement which is now understood to be taking shape for constituting a committee under the Board of Agriculture, on which engineering, scientific, and agricultural interests will be represented, with a view to securing the above object, as well as deciding on suitably-priced standard apparatus, and promoting investigation of the technical problems involved in the application of the electric discharge, must be regarded as a logical one, though somewhat unexpected.

Unfortunately, our experience of committees formed under the wing of a Government Department has been, up to the present, disheartening—the Board of Trade Electrical Committees are typical—and it would appear to be too much to expect that a department with a record such as that of the Board of Agriculture will not automatically follow established precedent, and in effect delay, instead of facilitating progress.

That the Board should support the formation of a committee in the public interest is a right and proper thing, but it should be understood that the results of its deliberations will be accessible to the public at any time, and that the Board's only interest is that of a Department of State paid by the public to receive and act on any recommendations made by the Committee.

The Board should exercise no control whatever over the findings of the Committee, and it should be a *sine qua non* that investigators, acting on behalf of the latter, have no proprietary interest in the results of their labour other than that to which they may be legally entitled.

The Board of Agriculture has for some years interested itself in a small way in electroculture, but we would ask whether it is not a fact that during the past year or so, public interest having been aroused, and the need for expert guidance having arisen, the Board's advisers—presumably with its concurrence—have obstructed rather than assisted the development of the movement, which is intended to place electroculture on an industrial rather than a laboratory basis?

To put the matter plainly, we question the utility of the proposed committee—which can only cover ground which is clearly within the scope of the existing I.M.E.A. Committee on the Development of Electricity in Agricultural Areas—and we hesitate to accept its suggested objects at their face value. The I.M.E.A., through its Agricultural Committee, has done more to promote the use of electricity in farming during the past six months than a Government departmentally-controlled committee would have accomplished in three years. This, together with the fact that the proposed committee will deal only with electroculture—which in itself will not for a few years be of so much importance to the farmer as the general applications of light and power—leads one to suggest that, instead of the Board going out of its way to form an overlapping committee to deal with matters already occupying the attention of an existing and much more practical body, it should give its whole support to the latter with a view to developing it into what it will, if its objects, mentioned in our issue of March 23rd last, are secured, become naturally, viz., a National Agricultural-Electrical Committee, with sub-committees representing all the various interests involved—electrical, scientific, agricultural, manufacturing, governmental, &c.

THE "EMPRESS WORKS" OF MESSRS. E. BROOK, LTD., HUDDERSFIELD.

Amongst the younger firms engaged in the manufacture of electric motors, the firm of E. Brook, Ltd., occupies a prominent position. It was founded at Huddersfield in 1904, for the purpose of making single-phase motors and starting gear, and, from small beginnings, quickly developed, new premises being occupied in 1905 to accommodate the growing business, which was extended to include the manufacture of three-phase motors in the following year. Branch workshops and show-rooms were also opened at Leeds and London in 1911 and 1912, and numerous agents were appointed in British and Dominion centres.

In 1915 it was decided to erect a new works on up-to-date lines at Longroyd Bridge, and the factory was completed in May last, though the offices and some of the smaller buildings were not finished until last month. Provision has been made for the manufacture of motors up to 200 H.P., with an output of 50 motors of various sizes per week; up to September 7th the firm had made 17,446 machines, aggregating upwards of 348,000 H.P., and the new works are already fully employed. The area occupied by the establishment is about 2½ acres, 4,800 sq. yd. being available for extensions. The machine shop measures 168 ft. × 163 ft., and has a floor area of 3,043 sq. yd.; iron and brass foundries are provided at the rear of the machine shop, the former covering an area of 120 ft. × 40 ft., and the latter 40 ft. × 25 ft., with a modern equipment of moulding machines, compressed air and sand-blasting plant, &c.

Fig. 1.—Iron Foundry.

Fig. 4.—Winding Bay.

Fig. 2.—Boring and Turning Machines and Lathes.

The accompanying views show the interiors of some of the departments, which are equipped with a variety of lathes, planers, boring and turning machines, radial drills, &c., in most cases with a separate motor driving each machine. The main bays are traversed by electric cranes, and portable cranes are provided in the winding shops, as well as electric lifts to the higher floors.

The test room is provided with a switchboard and transformers, which enable motors to be tested with one, two, and three-phase current at from 50 to 800 volts, 45 to 100 cycles per second; special braking appliances have also been installed to facilitate test runs.

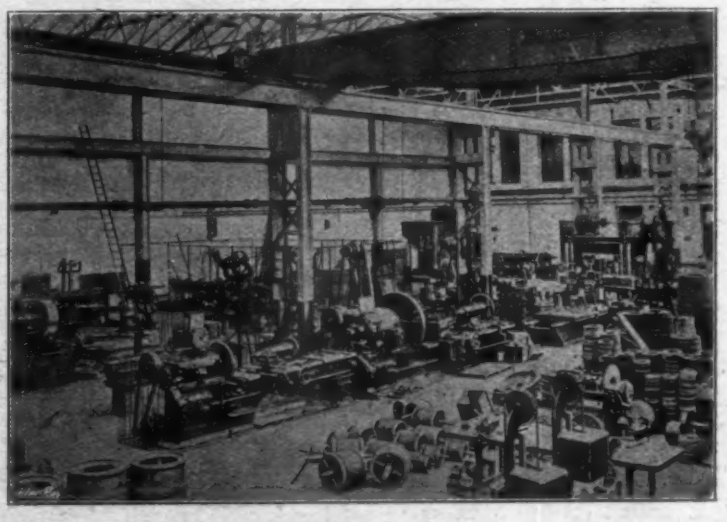

Fig. 3.—Large Lathes and Planers.

The buildings are heated throughout on the low-pressure hot-water system, and in other respects special attention has been devoted to the welfare of the employés, with whom the management have always maintained most cordial and kindly relations; a canteen is provided, with hot-water supply and

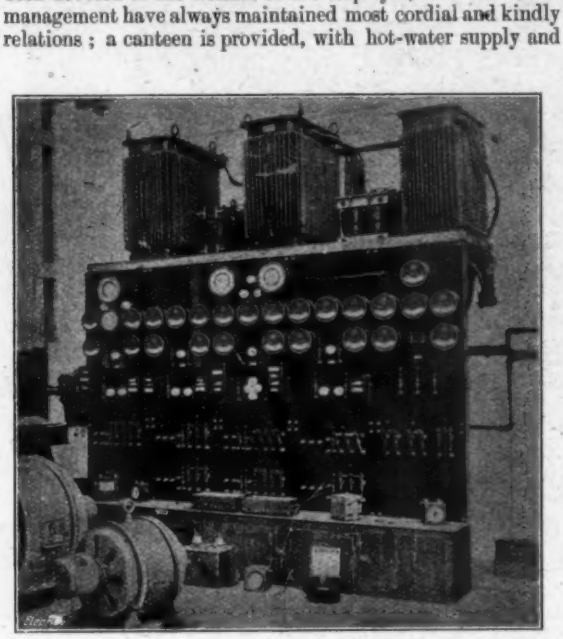

Fig. 5.—Testing Switchboard.

a well-equipped kitchen, comfortable dining rooms, and lavatories, and meals are served to about 100 employés daily; in addition, the canteen is opened for half an hour

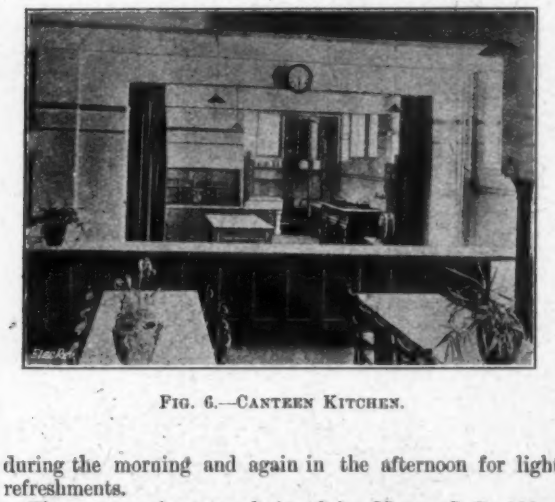

Fig. 6.—Canteen Kitchen.

during the morning and again in the afternoon for light refreshments.

The new works were designed by Messrs. J. B. Abbey and Son, architects, Huddersfield, and were erected under their supervision; on Saturday last they were formally opened by Mrs. Ernest Brook, in the presence of a number of visitors.

Electric Steel Manufacture in Denmark.—A company has been formed in Denmark, with a capital of 600,000 kronen, for the manufacture of steel from scrap, which is being melted and refined, with a little new iron added. It is said to be the same process which the Krupp works use for the manufacture of their best guns. To commence with, the new undertaking will confine its work to the production of smaller articles, machine parts, &c. Scrap is said to be available in sufficient quantities, but up to now it has principally been exported to Sweden. The new company, consequently, is fairly independent of foreign supplies, which is a very important point under the present circumstances. Operations will commence probably by the end of November, and work is expected to be in full swing by the beginning of the new year.—*Engineering.*

THE FIXATION OF ATMOSPHERIC NITROGEN.

Nitrogen is one of the four elements indispensable to animal and vegetable life, and the average adult consumes from 10 to 20 grammes per diem in one form or another. It is a curious fact, however, that the majority of plants cannot abstract (or "fix") gaseous nitrogen from the atmosphere, but have to draw their supply of this element from nitrates in the soil. Nitrates thus consumed may be replenished by natural manures, but the tendency is to use, more and more extensively, artificial fertilisers containing nitrogenous compounds made by the fixation of atmospheric nitrogen. In addition to the practically illimitable demands of agriculture for nitrates, chemical industries use ever greater quantities and varieties of nitrogen compounds. The old conception of nitrogen as a particularly inert element has had to be modified since the electric furnace showed it to combine readily with many substances at temperatures exceeding 1,000° C., with the formation of compounds which have many valuable applications.

Sources of Nitrogen.—Nitrogen compounds exist in small quantities in the soil, and are a product of vegetable decay. A very small quantity of nitrogen (about 12 lb. per acre per annum in this country) is carried into the soil by rain, in the form of dissolved compounds produced by electrical discharges. The activity of various bacteria is responsible for withdrawing much larger quantities of nitrogen from the atmosphere, but still not nearly enough for the needs of modern agriculture (for instance, an average crop of wheat withdraws from the soil about 535 lb. of nitrogen per acre). The guano deposits in Peru and on the island of Majorca are exhausted, and it is unlikely that the Chilean nitrate beds would last for more than another century or so at the pre-war rate of consumption; nor is it likely that any other natural deposits of similar magnitude will be discovered. In view of the rapidly increasing consumption of nitrates, it is of immediate importance to see that artificial means are available for producing the whole of the requisite supply.

One industrial source of fixed nitrogen lies in the distillation of coal. The latter contains 1 to 1½ per cent. of nitrogen, and during distillation in a closed retort, 15 to 20 per cent. of this nitrogen is converted to ammonia. From 100 tons of coal there may be obtained about 1·2 tons of ammonium sulphate, containing 20 to 21 per cent. of nitrogen. This sulphate may be converted easily into nitric acid (for use in making explosives, dye-stuffs, perfumes, &c.), or it may be used as a fertiliser, and is then readily converted to nitrate in the soil. For some time this was the only industrial source of fixed nitrogen, but the quantity thus available is limited (especially whilst so much coal is burnt without by-product recovery), hence the attention which has been paid to fixing nitrogen from that inexhaustible reservoir, the atmosphere.

The world's production of sodium nitrate has ranged from 2,000,000 to 2,700,000 tons per annum since 1908; and the production of ammonium sulphate increased steadily from 852,000 tons in 1908 to 1,610,000 tons in 1913, since when no statistics are available. The increasing cost per ton of these materials formed an additional incentive to the synthesis of nitrates from atmospheric nitrogen, and great advances have been made in the technique of producing nitrogen compounds since the war brought about such an unparalleled demand for explosives. But for the proficiency attained by Germany in this respect, the war would have been ended before this by lack of explosives in the Central Empires. Germany imported more than 500,000 tons of Chile nitrates during the first half of 1914, but it is probable that none of the belligerents will import much Chile nitrate after the war. In other words, the fixation of atmospheric nitrogen is an established industry, meeting or capable of being extended to meet all requirements.

Fixation Processes.—Confining our attention simply to processes which are of proved industrial value, these may be divided into three main groups:—(1) Processes for the direct oxidisation of atmospheric nitrogen—*e.g.*, Birkeland-Eyde, Schoenherr, and Pauling processes; and the Hausser process for exploding compressed gases. (2) Combination

of nitrogen with hydrogen to form ammonia, as in the Haber process. (3) Fixation of nitrogen on metals or metallic compounds—*e.g.*, Franck & Caro's process for fixing nitrogen on calcium carbide; and Serpek's process for fixing nitrogen on aluminium. Whilst the processes of group (1) yield nitric and nitrous acids directly, those in groups (2) and (3) lead to ammonia—*viâ* cyanamide or nitrates. Since nitric acid and its salts are of great importance, methods have been devised for oxidising ammonia and obtaining nitric acid with almost full theoretical efficiency.

Although almost the whole practical development of fixation processes has occurred during the past ten years, there were about 388,000 tons of nitrogen fixed during 1916, equivalent to about 2,450,000 tons of 15½ per cent. nitrate, a production equal to, or greater than, that of Chile nitrate during the same year. Before the American Electrochemical Society in April, 1916, the world's production of fixed nitrogen was stated as follows:—

Tons of fixed nitrogen in—	1913.	1915.
Oxidisation by arc	16,915	27,570
Haber process	7,300	54,430
Calcium cyanamide	59,490	190,000
	83,705	272,000

The data for 1915 are approximate, and certainly represent an underestimate; production was more than doubled during the year, and at the beginning of 1916 about 1 million H.P. was used for the synthetic fixation of nitrogen.

Direct Oxidisation Processes.—Although Franck and Caro's patents concerning the fixation of nitrogen on calcium carbide date from 1898, the manufacture of calcium nitrate by direct oxidisation of nitrogen was only brought to industrial perfection about the same time as the cyanamide processes. During 1903 the first Birkeland-Eyde equipments, of 25 and 150 H.P. respectively, were set to work, and since then the production of calcium nitrate by this process has increased continuously, and now amounts to 200,000 tons per annum.

At high temperatures (1,000° C. and over) nitrogen combines with oxygen to form nitric oxide (NO), but the action is reversible, and the speed of decomposition is considerably greater than the speed of formation. The concentration of nitric oxide in air exposed to suitable temperature (developed by the electric arc), is determined by the principle of mass-action, and, in order to reduce the proportion of decomposition, the air is blown quickly past the arc; once the gases reach a zone at 1,200° C., or lower temperature, the loss by decomposition of the oxide becomes comparatively small. Using air as raw material, the concentration of nitric oxide when equilibrium is established in the reversible action is 0·35 per cent. at 1,811° C. (absolute), 0·98 per cent. at 2,195°, 2·02 per cent. at 2,580°, 3·57 per cent. at 3,000°, and 4·39 per cent. at 3,200°. Equilibrium is never attained in practice, and gas leaving the furnace rarely contains more than 1 or 1½ per cent. of NO (Birkeland-Eyde, 0·5 per cent.; Schoenherr, 1·75 per cent.; Pauling, 1·2 per cent.).

The theoretical efficiency with air at the temperature of the electric arc (about 3,600°) is about 10 per cent., and on this basis 1 KW.-hour should provide 180 grammes of nitric acid and 1 KW.-year of 8,000 hours should yield 3,170 lb. of acid. In point of fact, industrial furnaces yield only about 1,230 lb. of nitric acid per KW.-year, corresponding to 3·9 per cent. efficiency, as a maximum. Schoenherr estimates that the energy consumed in his furnace for the oxidisation of atmospheric nitrogen is distributed as follows:—

Formation of NO	3 per cent.
Lost in furnace cooler	40 ,, ,,
Lost by radiation	17 ,, ,,
Recovered in boilers	30 ,, ,,
Given to final cooler	10 ,, ,,
	100 ,, ,,

If a mixture of equal parts of nitrogen and oxygen be used, instead of air as raw material, the theoretical equilibrium-concentration of nitric oxide is increased by 25 per cent., and is considerably greater in practice; the theoretical production of nitric acid then exceeds 4,620 lb. per KW.-year, but the mixture of pure gases has never been used industrially.

Nitric oxide made as above is oxidised to nitric peroxide by the action of oxygen after cooling the gas to about 40° C. before admitting it to the oxidising towers. The peroxide is converted to nitric and nitrous acids by the action of water, and a residue of gas which cannot be converted to acid, owing to certain instability in the action, is recovered in a soda tower as sodium nitrite, a material which is essential to the dye-stuff industry. The 30 per cent. nitric acid is either concentrated or converted to calcium nitrate, which is a valuable fertiliser.

The Birkeland-Eyde Process.—The furnace used in this process has not been modified in any essential particular since its introduction more than 10 years ago.* The electrodes are placed in a magnetic field perpendicular to their plane, so that the arc is drawn out into the form of a half-disk. Where alternating current is used, the arc is formed alternately as two half-disks, which present the appearance of a complete disk. Single-phase current at 5,000 volts, 50 cycles is employed, and the cylindrical furnace-casing of sheet-iron is provided with perforated refractory bricks which divide the air supply into a number of streams. The electrodes are water-cooled, and a magnetic field of 4,500 to 5,000 C.G.S. lines per sq. cm. is maintained between them. About 10 per cent. of the total energy expenditure is absorbed by the field coils.

Whereas the first Birkeland-Eyde furnaces consumed only 600 KW., later ones consume from 1,000 to 4,300 KW. In the Saaheim works there are eight 3,500-KW. furnaces in operation. The diameter of the arc flame in the latter case is about 8 ft. The temperature of the flame exceeds 3,000° C., but in spite of the high temperature to which they are exposed, the electrode ends need changing only once in three or four weeks, whilst the refractory masonry lasts from four to six months. Gases escape from the furnace at a temperature between 800 and 1,000°, and some of the heat which they carry is utilised to raise steam for concentrating the nitrate water obtained in another stage of the process. After leaving the boilers, the gases are cooled to 40° by passage through aluminium tubes on which water is sprayed. In successive towers filled with refractory brick, quartz, or other appropriate material, the cooled gases are oxidised to NO_2, which is combined with water to yield 40 per cent. nitric acid, and the residual gas is recovered in soda towers. The total absorption is about 97 per cent. of the nitric oxides formed. There are various alternative chemical processes for the production of different nitrogen compounds,† but the key process is the fixation of the atmospheric nitrogen. Dilute nitric acid may be concentrated, or combined with ammoniacal liquor to form ammonium nitrate; but it is generally used to make calcium nitrate. The yield of calcium nitrate amounts to 1,900—2,100 lb. per KW.-year, corresponding to 1,000—1,210 lb. of nitric acid.

The development of the nitrate industry in Norway has been extremely rapid, the pre-war progress being as follows:—

Works.	Date.	Total H.P.
Froguerkilem Fabrik	July, 1903	25
Ankerlokken	Oct., 1903	150
Vaamoen and Arendhal	Sept., 1904	1,000
Notodden	May, 1905	2,500
Notodden and Svaelgfos	May, 1907	42,500
Notodden, Svaelgfos, Lienfos, and Rjukan I	Nov., 1911	200,000
Rjukan II	1913	120,000

All these works are in the district of the R. Telemarken, and the total horse-power utilised for the fixation of nitrogen has increased from 200,000 H.P. in September, 1912, to about 300,000 H.P. at the present day. The Notodden Works produce, per annum, 20,000 tons of calcium nitrate, 4,000 tons of sodium nitrite, and 4,000 tons of ammonium nitrate. The Saaheim (Rjukan I) works consumes about 100,000 KW.-years per annum, and pro-

* A detailed description is to be found in the ELECTRICAL REVIEW, January 9th, 1914.

† For details of these processes, and for many other chemical data relating to the fixation of nitrogen, reference may be made to *Génie Civil*, Vol. 70, pp. 319, *et seq.*, whence some of our present notes are derived.

duces 70,000 tons of calcium nitrate and 8,000 tons of sodium nitrite, *i.e.*, 1,540 lb. of calcium nitrate and 176 lb. of sodium nitrite per KW.-year, corresponding to 1,100 lb. of 96 per cent. nitric acid. The cost price of calcium nitrate is 86s. to 100s. per ton, and that of nitric acid (36° Beaumé) 150s. to 175s. per ton.

(To be continued.)

THE UTILISATION OF UNDEVELOPED FUELS IN PULVERISED FORM.

A RECENT issue of the *General Electric Review* contained an article on the above subject by Mr. V. Z. CARACRISTI, of the Locomotive Pulverised Fuel Co., portions of which, dealing with the question of steam raising, we reproduce below:—

High rates of combustion are, in large power plants particularly, of extreme economic importance, the capital investment being reduced in direct proportion to the rates of burning; nearly all of the accepted types of boilers are beyond the capacity of the furnace in their ability to utilise the heat generated in the furnace, and particularly when the boiler equipment is supplemented by economisers or other means of utilising the heat lost through high waste gas temperatures. Although owing to the small specific heat of the gases, in combination with the loss of efficiency brought about at low temperatures in the transmission of such heat to the water in the boiler tubes, the high stack temperature is not as great an economic loss as is popularly supposed.

The development work done in combustion through the use of stokers, in combination with under-grate blowers and retorts, has about exhausted the possibilities in this direction, and a radical departure from the existing practice is necessary in order to utilise to the fullest possible extent the thermal energy of fuel.

The use of fuel in pulverised form offers a basis for further development work in this connection.

The fact that fuels having relatively high volatile contents, when dried and pulverised, are so readily combustible, has

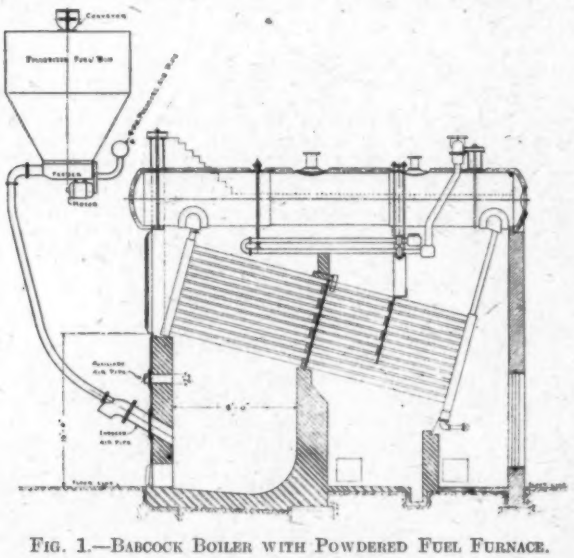

FIG. 1.—BABCOCK BOILER WITH POWDERED FUEL FURNACE.

caused a great many experimental developments in this direction to be failures, particularly when efforts were made to maintain a rate of combustion in excess of that normally obtained through the use of stoker equipment having under-grate blast. It has, however, been demonstrated in service that it is possible to burn to CO_2 more than 98 per cent. of the combustible matter with an excess of air supply of less than 10 per cent., without any deductions for combustible in the ash, this being irrespective of the volatile or ash content of the fuel or the analysis of such ash. This result is being obtained at a rate of combustion equivalent to 175 lb. of coal per square foot of grate area per hour, and without the necessity of increasing the combustion space volume by high boiler setting; the CO_2 contents of the escaping gases under these extreme overload conditions being very close to the theoretic, and the CO content of the escaping gases being nil.

The use of pulverised fuel in stationary boiler plants when the installation is of sufficient size to absorb a reasonable amount of increased capital is justified for the following reasons:—

1. Ability to force the boilers, without loss of combustion efficiency, to a rating which will develop a horse-power for each four or less square feet of heating surface.

2. Greater heating value per cubic foot of furnace volume, eliminating the necessity for raising the boilers in order to secure overload capacity.

3. Reduction of the initial capital investment in the boiler plant on account of the reduction in the amount of heating surface in the boilers necessary to carry a given load under operating conditions.

4. Ability to maintain full steam pressure with low-grade fuels under extreme overload conditions.

5. Ability to utilise from 96 to 99 per cent. of the heating value of the combustible, irrespective of the ash content or analysis.

6. Elimination of grates and mechanical equipment for stoking and the maintenance incident thereto.

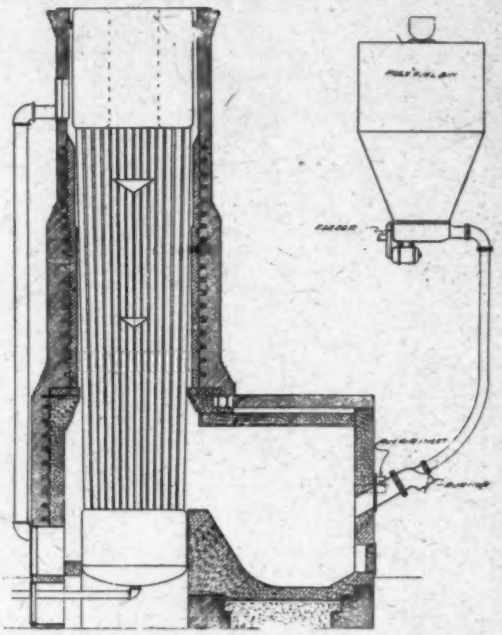

FIG. 2.—CAHALL BOILER WITH PULVERISED FUEL EQUIPMENT.

7. Elimination of draught blowers for the purpose of securing overload capacity.

8. Elimination of operating difficulties brought about by the clinkering of coal on grates, and the resultant loss in boiler capacity during periods of cleaning fires.

9. Ability to quickly take on heavy overload and to cut out the fuel feed when the necessity for such overload has ceased. The cutting out of the fuel feed in a pulverised fuel installation instantly stops combustion and the use of fuel, whereas in a grate-fired installation the amount of coal remaining on the grates is of necessity lost.

10. Elimination of the necessity for keeping banked fires in order to take care of irregular peak loads. With the use of pulverised fuel steam from cold water can be raised to working pressure as quickly as from a banked fire.

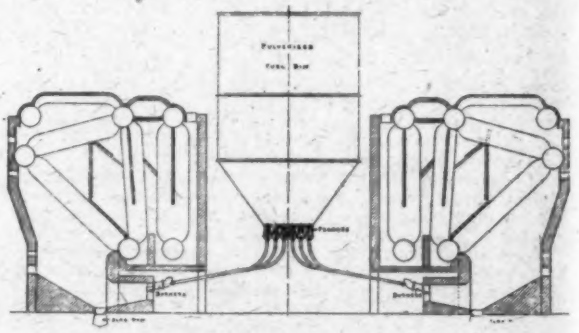

FIG. 3.—BADENHAUSEN BOILERS ARRANGED FOR BURNING POWDERED FUEL.

11. Elimination of smoke from the stack and the consequent freedom from liability under legislative requirements as to the smoke nuisance.

12. Reduction in the size of the buildings necessary to hold the boiler equipment, together with a reduction in the cost of the steam and water piping in the boiler room.

13. Material reduction in the height of the stack, this reduction in height being brought about by the fact that all of the air admitted to the firebox passes direct into the combustion zone, without the necessity of passing through a fuel bed, permitting the boiler to be operated under an overload with less vacuum.

14. Reduction in the cost of operation, brought about by the fact that the feeding of pulverised coal to the furnace requires practically no attention.

15. Reduction in the cost of handling ashes, brought about by the greatly reduced volume.

As an offset to the above advantages may be set up the cost of preparing the fuel for burning in pulverised form.

The expense of properly preparing the fuel may be divided into four divisions:—

First. The expense of crushing the coal, freeing the coal from stray iron, and *elevating the same to bins,* preparatory to pulverising.

In so far as this equipment is concerned it is the same as would be required in hand or stoker fired installations.

Second. The cost of drying the coal.—With equipment which is commercial the coal can be freed from moisture at a reasonable power and fuel expense. The power and fuel required are greater with lignite than with anthracite or bituminous coal, bituminous coal being more easily dried than either of the other fuels.

Third. The power required to pulverise.—Although accurate figures are not available, the power required to pulverise coal to a fineness necessary for combustion in suspension, with commercial equipment as manufactured at the present time, is from 8 to 9 KW.-hours per ton for bituminous coal and lignite, and from 15 to 17 KW.-hours per ton of coal for anthracite or graphitic coals and coke breeze.

Fourth. The maintenance of equipment necessary to prepare fuel.—The maintenance on the equipment for the preparation of fuel will be approximately, using present commercial equipment, from 2 to 3 cents per ton for bituminous and lignite coals, and from 4 to 5 cents per ton for anthracite and coke breeze.

The cost of preparing and pulverising, however, should not be considered as an operating charge. This cost is directly chargeable against the cost of fuel, and in determining the savings which can be effected by means of burning pulverised fuel in suspension, this cost should be added to the cost of the fuel on a B.TH.U. basis arrived at. When making a comparison of the cost of fuel on a B.TH.U. basis in terms of evaporating results, when burned on grates and in pulverised form, it is conservative to figure that the combustion results will be from 20 to 30 per cent. better with pulverised fuel. This increase in combustion results will be sufficient to more than offset the cost of pulverising, leaving the difference in saving in cost per B.TH.U. due to the less price for the lower grade fuel as a net saving.

There is a considerable field for the development of equipment necessary for the drying and pulverising of fuel, but under the present commercial conditions the cost of preparing fuel is not prohibitive, even when considering the use of low-grade fuels having a high ash and low B.TH.U. content.

When the necessary air for combustion is introduced into the firebox the direction of the flame is toward the openings and the firebrick has to stand the radiation effect of the heat only, and is relieved of the scouring action.

The process of burning pulverised fuel differs from the process of burning gases arising from coal burned on grates or the burning of fuel oil, in the fact that the temperature of the ash in suspension, when burning pulverised fuel, becomes great enough to make the process of combustion self-sustaining, reducing to a minimum the necessity for heat radiating or regenerating refractory surfaces when the velocity of the flames through the combustion space is not too great. It is essential that feeders be of such a design that they will deliver from 3,000 to 5,000 lb. of pulverised fuel per hour; and that the pulverised fuel handled by the feeder will be thoroughly intermingled with the air used as a conveying medium. It is also essential that the velocity of the fuel entering the firebox be less than the velocity of the combustion air surrounding this fuel inlet.

Experience has demonstrated that it is very practicable to burn, within a very limited space, 5,000 lb. of coal per hour fed by one burner, the fuel being converted into gases within the distance of less than 10 ft., provided the incoming mixture is uniformly distributed throughout the cross section area of the delivery pipe, so that a refractory wall located a distance greater than 10 ft. from the fuel inlet will be free from any impinging or cutting action of the flame.

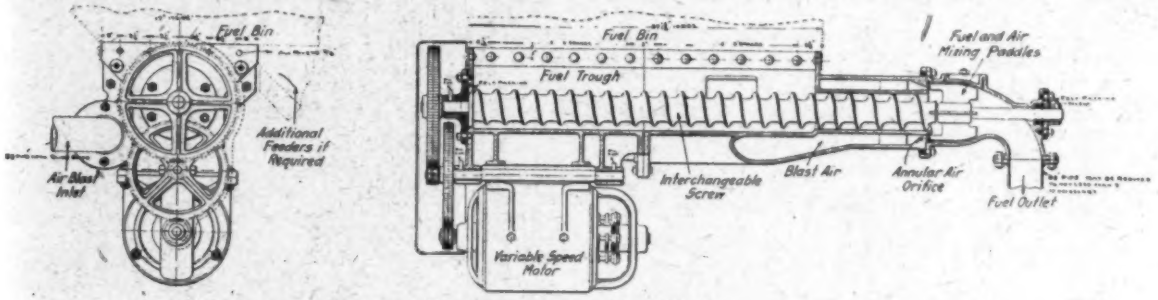

FIG. 4.—PULVERISED FUEL FEEDER.

An item of prime importance is to operate the firebox under a vacuum. This vacuum can be as low at 15/100 of an inch of water. It is also of importance that auxiliary air for combustion be induced into the firebox in or near the zone of maximum temperature.

Burning pulverised fuel at high rates of combustion and in large volume tends to form a layer of CO_2, preventing the access of oxygen to the unconsumed core of the flame, and unless this core is broken up by cross currents it will pass into the cold area surrounding the boiler tubes, and combustion will not be completed.

The matter of combustion of pulverised fuel within a limited space of firebox is controlled by an element of time, and the slower the passage of gases through the firebox the more efficient the combustion results.

The items which affect the combustion of pulverised fuel are:—

1. Volatile contents, affecting the temperature of the flash point.
2. The degree of fineness to which the fuel is pulverised.
3. The amount of moisture in the fuel.

Low volatile contents can be offset by increasing the fineness of the fuel.

The amount of moisture in the fuel is of only minor importance in so far as combustion is concerned. The reduction of moisture affects the thermal results only slightly, and the combustion practically not at all; from which fact it can be noted that the higher the volatile content of the fuel the less is the expense necessary for pulverising.

The formation of honeycomb and clinker on the heat-absorbing surfaces is brought about largely by the iron content in the ash, and can be prevented by a through oxidation of such iron in the combustion zone.

The formation of slag in general will be in direct ratio with the amount of incandescent surface with which the ash in suspension has an opportunity of coming into contact. The ash in suspension which does not come into contact with incandescent surfaces will readily pass out of the stack in extremely minute particles in the form of a very light haze, a small proportion remaining in any eddies which the boiler setting may cause in the passage of the gases to the stack, and the use of horizontal baffles should be avoided.

TRADE IN CANADA.

Influence of Capital.—In his report for the year 1916, H.M. Trade Commissioner in Canada (Mr. C. Hamilton Wickes) draws attention to the relative yearly investment of British, United States, and Canadian capital in Canadian Government, municipal, railway, and corporation bonds during each of the years 1909 to 1916. The estimated figures are as follows:—

Years.	United Kingdom. Per cent.	United States. Per cent.	Dominion of Canada. Per cent.
1909	74.00	3.90	22.10
1910	81.50	1.50	17.00
1911	76.56	6.58	16.84
1912	72.65	11.35	16.00
1913	74.25	13.65	12.10
1914	68.25	19.75	12.00
1915	14.20	42.10	43.70
1916	1.50	64.90	33.60

Last year Canada sold $316,000,000 of such bonds, of which United States investors purchased $205,000,000. It will be noted that up to the year 1912 the investment of United States capital was practically negligible, while the United Kingdom supplied about 75 per cent. of Canadian requirements until the outbreak of war. During the period 1909-14 no great effort appears to have been made by the manufacturers and merchants of the United Kingdom to improve their trade in the Dominion as a direct consequence, or as a condition of these immense investments. With the investors of the United States it is different. In the majority of cases it is made a condition of the contract that the funds so advanced shall be expended on plant, machinery, and goods produced

in the United States, and to this end their bankers and manufacturers have combined their efforts. The commercial advantages thus obtained will be difficult to modify so long as present financial conditions prevail.

In Ontario, however, sentiment is strongly in favour of the purchase of Canadian and British goods. This sentiment seems to be taking the place of the more restricted campaign, prominent in 1915, urging the purchase of "Made in Canada" goods.

Complaint is still heard occasionally as to the lack of personal attention given by British manufacturers to the requirements and details of this market, as compared with the attention given by United States manufacturers. There is a personal touch in evidence in United States trading relations with Ontario which helps considerably to increase that country's volume of trade. This personal touch extends to constant effort on the part of manufacturers to obtain orders, following the raising of loans by Canadian borrowers in the United States.

The Ontario Hydro-Electric Commission will again be a large buyer of motors, copper wire, insulators, sluice gates, generators, and power plant during 1917. It has hitherto purchased its current from corporations at Niagara Falls, but has now decided to build its own power generating plant, construction of which will probably be commenced at an early date. The Commission will also be a large buyer in the comparatively near future of electric railway plant and material in connection with a scheme of electric radial railways throughout the Province.

Trading Hints.—The manager of one of the most important metal and hardware firms in the West, in speaking of the desire of his firm to deal more largely in British goods, testified to the value and usefulness of many articles of United Kingdom manufacture. In common with nearly all other business men, however, he spoke of the difficulties attending the development of British trade in Western Canada. It was generally remarked that British firms, with the exception of some striking examples to the contrary, are ill-informed as to what the West can buy and use, and of the terms and conditions which Canadian firms find it necessary to employ in the conduct of their business. Prior to the war, many British manufacturers, quite unconsciously no doubt, gave Canadian buyers the impression that they did not want to effect sales, by their habit of writing back referring inquirers to "an export agency," or, if the orders were accepted, by being dilatory in shipping the goods. Attempts by British firms to open up business in a manner which hindered instead of helping towards the desired end were also remarked upon.

In appointing agents to represent them in Canada, British firms should investigate thoroughly the standing and reliability of the persons whom they contemplate employing.

The majority of Canadian importers, in goods handled directly or indirectly through the retailer, look for credit of 30, 60, or 90 days, customarily extended by the established American manufacturers. It is vain for British manufacturers of such goods to insist on "cash before documents," much less as some do, "cash before shipment." If the United Kingdom trader is to regain the trade which has been partly lost during the war he must ascertain the terms, and be prepared to allow equal terms, as regards credit, with manufacturers of similar goods in the United States.

The use of the cables, when business is being put through, is important. It is to be remembered that the principal centres of industry in the United States are only 12 to 24 hours' distant from Montreal and Toronto, and that business can be closed up by a personal interview between the seller in Chicago and the buyer in Montreal weeks before a letter on the same subject can go back and forth to the United Kingdom.

British shippers should make themselves familiar with Canadian Customs regulations and tariffs. Invoices must always be made out in triplicate and attached to bill of lading, and each invoice must contain the necessary clauses on the back in accordance with Customs regulations. Failure to forward these documents prevents the removal of goods from bond, causing great inconvenience and expense.

In making prices to possible customers, it is a great advantage to quote in Canadian currency, giving the fullest possible details as to terms, discounts, packing (how many in a case, &c.). Such terms as "c.i.f.," "f.o.b.," &c., are used very loosely on this side, and it is advisable—at the risk of what may appear redundancy—to make one's meaning perfectly clear. For instance, "f.o.b. Liverpool" might be rendered free of all possible chance of mistake by saying "Free on board steamer at Liverpool, ocean freight and insurance to be paid by the buyer," or "c.i.f. Montreal" might be made more specific by saying "Cost, insurance, freight to Montreal, delivered ex ship."

Catalogues, price lists, advertising cards, or any printed matter designed to attract the Canadian public should be expressed in dollars and cents, and not in British currency.

United Kingdom firms wishing to open up or extend business in Canada must realise that they have to face strong American competition. In Southern Ontario and Niagara Peninsular this is especially the case, and a large number of United States manufacturers have works or assembling arrangements in that district which are backed by strong selling organisations.

Many wholesale dealers insist that cheapness is by no means the determining factor in the Canadian market. It gives place to selling capacities, and to the tastes and requirements of the ultimate purchaser. They also complain that United Kingdom travellers are often so engrossed in the superiority of the article they carry as not to realise that intrinsic value is only one factor in the popularity of a commodity, and while the Canadian wholesaler is ready to acknowledge superiority where it exists, he is more concerned to find goods that will sell themselves and entail little or no education of his selling staff or the general public. Manufacturers should make the article the public require, and follow this by organised distributive effort. It should be understood that United States firms send well-trained salesmen into Canada in large numbers, and salesmanship being highly developed in the United States it must be met by selling ability of an equal or higher calibre on the part of United Kingdom manufacturers, particularly by firms wishful to introduce their goods, and also by those who desire to maintain and develop their existing trade.

THE ASSOCIATION MOVEMENT.

By HERBERT H. BERRY.

In the leading article in the last issue of the Electrical Review tribute is paid to the founders of the Cable-Makers' Association. As I believe there is no official record, I venture to give a short account of the creation and establishment of the existing C.M.A.

Some of the earlier years of my life were spent in acquiring a practical knowledge of the manufacture of electric cables of almost every description. I was fortunate to include in my experience a wide range of work, from a submarine cable which lies to-day across the bed of the Atlantic, down to the smallest leading-in wire used in an electric light installation.

I cannot appraise too highly the utility of my early experiences gained in the workshops and estimating department of Messrs. Siemens Bros., of Woolwich.

In 1894 I started business on my own account, and shortly afterwards, having a desire to turn my early training to account, acquired the sole selling agency in Lancashire, Yorkshire, Cheshire, Birmingham, and the Midlands, for the cables manufactured by the company I had lately left. But alas! competition, internal and foreign, became excessive and burdensome, and manufacturers were faced with the necessity to sacrifice quality or lose their turnover. I realised that a combination of British interests was the only logical outcome, and that good standard quality with a British hall-mark was a goal worth winning.

That was 20 years ago. An earlier effort had been made to bring all the cable makers together, but the result was unsuccessful.

After a preliminary conversation with my old chief, Mr. J. J. Easton, my first interview was with Mr. Alexander Siemens, who listened sympathetically to my plans, but at the same time expressed the opinion that such a combination of interests in the electrical trade would, if created, have a short life, and, at the longest, last for six months. I was unable to obtain an authoritative statement from him that his company would join any such general movement, but he said he would be willing to discuss the matter further with me after I had interviewed other interested parties. This was not a very encouraging start. I had to plough a lonely furrow, and, incidentally, to bear the whole expense.

During the following weeks I spent my whole time traversing the country, interviewing the parties chiefly interested. One of these at least has, I regret to say, joined the Great Majority; others have retired from active interest in the electrical industry. With one exception, I obtained the whole-hearted support of the cable-making trade, and the little opposition that presented itself soon vanished. From that time onward, members of the Cable-Makers' Association have developed their manufacturing resources, improved their standards, and attained a degree of prosperity to the general advantage of the whole electrical community. At the period of the outbreak of war, the financial records of the electrical cable industry were the envy of the electrical manufacturing fraternity, and the

one bright star in a firmament overclouded through foreign competition upon unequal terms.

I would like to repeat some significant remarks upon this subject made by Mr. James W. Gerard (late U.S. Ambassador in Berlin) in his *Daily Telegraph* articles. They are as follows :—

Combine for Selling Abroad.—The only thing that can maintain a fair price after the war for the products of American firms, miners, and manufacturers, is permission to combine for selling abroad.

With the low wages paid to very efficient working men, who worked long hours, and with no laws against combination, it was always a matter of surprise to me that the Germans, who were in the process of getting all the money in the world, should have allowed their military autocracy to drive them into war.

Trust and Cartel.—I am afraid, after this war, if we expect to keep a place for our trade in the world, that we may have to revise some of our ideas as to so-called trusts and the Sherman law. Trusts or combinations are not only permitted, but even encouraged in Germany. They are known there as "cartels," and the difference between the American trust and the German cartel is that the American trust has, as it were, a centralised Government permanently taking over and combining the competing elements in any given business, while in Germany the competing elements form a combination by contract for a limited number of years. This combination is called a "cartel," and during these years each member of the cartel is assigned a given amount of the total production, and given a definite share of the profits of the combination. The German cartel, therefore, as Consul-General Skinner has aptly said, may be likened to a confederation existing by contract for a limited period of time, and subject to renewal only at the will of its members.

It may be that competition is a relic of barbarism, and that one of the first signs of a higher civilisation is an effort to modify the stress of competition.

The German Courts have expressly said, if prices are so low that the manufacturers of a particular article see financial ruin ahead, that formation of cartels by them must be looked upon as a justified means of self-preservation.

The object of the American trust has been to destroy its competitors; the object of the German cartel to force its competitors to join the cartel.

Closely following the inception of the Cable-Makers' Association, my partner and I deemed it desirable to set on foot a co-operative movement amongst electrical manufacturers of accessories, and, having regard to the initial success of the C.M.A., collaborated with Mr. Bevis, of the General Electric Co., Ltd., who had conceived a similar idea, and we jointly founded the National Electric Manufacturers' Association. It is common knowledge that this Association was finally transformed into the British Electrical and Allied Manufacturers' Association, whose record, achieved since the outbreak of war, under the able secretaryship of Mr. Dunlop, is unparalleled, and must bring lasting and uplifting benefit to the industry.

My principal object, however, in writing now is to state that I am making an effort to co-ordinate the efforts of the many Trade Associations which now exist. As a first step, I have approached the Council of the Institution of Electrical Engineers, soliciting their support, and asking them, as the parent institution, to offer kindred institutions and federations the hospitality of their roof for joint meetings, which it is always desirable should be held upon neutral ground. I am glad to say the Council have favoured the suggestion and taken steps to put the resolution into immediate effect. This is a step for which the whole trade have cause to express gratification, and I am sure the premier Institution will benefit by the broad policy it has decided to adopt.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Electricity Supply Meters and Fuses.

A few suggestions on a somewhat neglected topic may not be out of place. The relation between a supply authority's meters and fuses is a most important matter if the meters are to have their just treatment. In all distribution systems the supply authority has a fuse on each consumer's premises, commonly termed "main" fuse. The main fuse is a protection for the meter so long as the size of the fuse is determined by the current capacity of the meter. A percentage overload should be allowed, say the fuse to be 150 per cent. to 200 per cent. the current capacity of meter, the latter figure to apply to power consumers. Rules to this effect, if not entirely lacking, are not sufficiently enforced to be made effective. Many main fuses have been found, the fusing current of which was 20 times the full load meter current; by their proportions they seemed capable of protecting the power station only. A piece of 91/30's stranded copper wire, and a large hair-pin, are two recently found "fuses" supposed to be protecting 5-ampere circuits.

Consumers should be encouraged to keep their fuses of a less capacity than the main fuse. This point is practically solved by charging consumers a small fee whenever the main fuse has been burnt out or tampered with. The subject is worthy of serious consideration since a burnt out or damaged meter may cost for repairs anything up to 50 per cent. of its initial price, if at all repairable.

Small meters also suffer ill-treatment in cases where they are used on lighting loads, the consumer also having a large power load. Almost without exception the lighting meter is connected through the same main fuse as the power meter. A quite common case is a 5-ampere meter connected through a 200-ampere fuse.

Thus the lighting meter is at the mercy of the consumer's fuse, which very often is the first piece of conducting material found that will fit into the fuse holder. Why not a separate main fuse of the required size? The meter is surely worth this small extra outlay. Many cases have occurred where the meter was entirely destroyed.

If the foregoing points were given a little more thought they would considerably reduce meter renewals funds and also relieve meter departments of a good deal of worry. Even small matters should carry weight in the "reconstruction" time.

H. G.

The E.T.U. and the A.E.S.E.

As one who has joined the A.E.S.E. and tried to join the E.T.U. I think my opinion may be of interest.

As to the A.E.S.E., it simply seemed to fizzle out; I was certainly not informed of its being suspended owing to the war.

In regard to the E.T.U., at present there does not seem to be any organisation for dealing with shift engineers in the provinces.

I believe that if only these two associations could amalgamate they would form a really strong union. There is a desperate need for one. The point to remember is that the organisation would have to deal with a number of scattered members.

I think the situation may be summed up in the words, "United we stand, divided we fall."

Shift Engineer.

At last the station engineers have a live organisation—namely, the Station Engineers' Branch of the "Electrical Trades Union." Its membership is very large, and is rapidly increasing. There are three branches in London, and a fourth and fifth will open in a few days. Station engineers' branches have also been established at Birmingham, Glasgow, Liverpool and Manchester.

These facts should convey to those who at present are not members that the station engineer has realised the advantages of allying himself to an efficient and sound body who study his best interests.

The long-dormant A.E.S.E. realise that it is time for them to wake up, but their tactics *re* conferences are certainly not shrewd or well-planned, as an effective organisation will not tolerate any interference of a body that has been asleep for two years.

The "status craze," although it still lingers, is developing broadly on democratic lines, and the station engineer finds that whilst the A.E.S.E. is still yawning, the E.T.U. has drawn up a "Schedule of minimum rates for station engineers," and negotiations are at present in progress for its adoption, combined with a war wage.

We welcome Mr. W. J. Ebben and his colleagues of the A.E.S.E. to join us as members of the E.T.U., when we can greet them as brothers in effort and brothers in our assured success.

Charles W. Barnes,
Secretary, No. 2 Branch London Station Engineers,
Electrical Trade Union.

Lack of united organisation in the past is the cause of the low money paid to station engineers.

The A.E.S.E. have been in existence, and supported by central station and sub-station engineers, for a number of years without any apparent result regarding a general increase of wages.

The E.T.U. (who have drawn up a trade card for London with definite rates for shift engineers, switchboard attendants and sub-station attendants) after about eight months, have now in London alone the support of about 700 station men of all grades, many of them former members of the A.E.S.E.

The A.E.S.E. have been roused from inactivity through the E.T.U. successfully bringing their trade card before Sir George Askwith, and their resuscitation at this particular time would seem to indicate a recognition of the strength of the E.T.U. station engineers, and a desire to be included in any award the E.T.U. may obtain, without associating with a Union which is open to their (sometimes better paid) assistants.

Since every man in a power station performs his respective and necessary duties, and the shift engineer is dependent on his assistants for the satisfactory running of a shift, there can be nothing derogatory for a shift engineer to be in the same Union with his men. In some stations drivers are appointed shift engineers when vacancies occur, consequently a Union composed of shift engineers alone must be less potent than one embracing all grades of staff.

The shift engineer has status, staff and responsibility and is expected by his chief to be dignified. His remuneration, however,

is neither consistent with the responsibility, commensurate with the danger, adequate for maintaining status, nor compatible with dignity. What discipline could be maintained by a foreman whose men earned more or as much as he? And what dignity could a chief engineer maintain if his salary were not greater than that of his assistants?

The shift engineer's position is very difficult and absolutely anomalous; indeed, I know of no parallel in any other occupation, and the sooner we all unite in one organisation the sooner we may hope for better conditions.

Since both E.T.U. and A.E.S.E. have the same end in view, success would probably be hastened by joint action instead of being at loggerheads as apparently they are now.

Engineer-in-Charge,
October 8th, 1917. I.E.E. and E.T.U.

Instructions to Meter Readers.

It hardly appears from Mr. Withey's letter that he can have had very much experience in dealing with a staff of meter readers, or of the class of conversation they are likely to have with consumers. I can assure Mr. Withey that such conversation is much more likely to consist of opinions that the meter is 200 per cent. fast, or the voltage 25 per cent. below normal, than of inquiries that would greatly interest the Publicity Department. The business of meter reading, moreover, is one that is usually required to be carried out in the smallest possible time, and the suggestion that meter readers should combine a sort of half-hearted canvass with their proper duties can scarcely be regarded as practicable.

G. W. Stubbings.
London, E., *5th October*, 1917.

Accountancy in Small Undertakings.

There has been in the last few years a great increase in the number of village and small town electricity schemes. Many of these are run by small companies of local people, the clerical work being undertaken as a part-time job by some local man with an aptitude that way. An experience of the writer may be of interest in this connection.

In the case under notice the engineer happened to see, quite by chance, a draft of the balance-sheet which the secretary had prepared. He saw that the financial results as presented thereon were very seriously incorrect, and, on looking further into the matter, found one of the items under "Running Expenditure" to be extensions to plant! Further, under the heading of "Repairs and Maintenance" were included scores of pounds' worth of new poles, wires, and meters used in extending a supply to absolutely new customers. The secretary, on being remonstrated with, admitted that all these things were an addition to the assets of the concern, but could not be induced to alter the sheet. At a meeting of the directors the matter was brought up by the engineer in his own interest, as the real maintenance costs had been quite normal, or rather on the low side. In the same case, also, the amount of gross profit had been given to the income-tax collector as net profit, causing the company to pay double what it should have done for three years' running.

All this was admitted by the directors, but the suggestion that a chartered accountant should be paid a fee occasionally to overlook the accounts—a fee which would have been repaid many times over by the money lost to Inland Revenue—was not accepted. The natural effect on that engineer is this—that he feels that, however well he may do in keeping down costs, the credit due to him is liable to be effectually obliterated by faulty accountancy over which he has no control, and he is on the look-out for a position where striving for efficiency will bring him more appreciation.

I do not know whether any others of your readers have encountered this difficulty in these small concerns.

Country Mouse.

LEGAL.

The Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd.

The following is a copy of the award of Mr. James Swinburne, F.R.S., the arbitrator in this case, the hearing of which was reported in the Electrical Review for July 20th, p. 58.

"With regard to the Kensal Town supply, I find that:—

"1. Clause 3 of the agreement of 1900 means that the respondents are to take from the joint station at Wood Lane all the electrical energy over and above that generated by its own generating station at Bulmer Place that they require.

"2. Though the privileges granted by the Kensington and Notting Hill Act of 1899 were not specifically extended by the Act of 1909, the companies are justified in taking energy from Wood Lane for the supply of fringe consumers: and the agreement of 1900 binds them to do so, as long as any of the stock mentioned in it is outstanding, to the full extent to which they would have been bound had the Act of 1899 specially entitled them to use Wood Lane supply for fringe or outside areas.

"3. The respondents' business is all their supply of electrical energy, including any supply of energy which was not, or is not, duly authorised by Act of Parliament.

"4. The respondents make no secret of taking energy from outside sources; but the claimants did not know, or its officers did not realise, until recently, that this involved any question arising out of the agreement of 1900; and the claimants did not recommend taking outside supply, nor did they condone any infraction of the agreement. The claimants have suffered damage.

"5. By the agreement of 1900, so long as any of the stock shall be outstanding, each of the two companies shall from time to time take from the joint station all such electrical energy, in excess of that generated in its own station or stations existing within what was its statutory area in 1900, as such company may require for the purpose of supplying energy in accordance with the provisions of the principal agreement or such other provisions as may from time to time be agreed upon between the two companies or settled unanimously by the Committee.

"6. In accordance with 1, 2, 3, and 4, the respondents shall pay the claimants the sum of £189 (one hundred and eighty-nine pounds) damages in respect of the supply in Kensal Town in 1909; and in respect of the costs of this branch of the reference, a sum equal to one-tenth of the total taxed costs of the claimants, in the whole of the proceedings before me. But if it should be held that I am wrong in my view of the construction of the agreement concerning the supply in Kensal Town in 1909, the respondents shall not pay the said £189 or corresponding costs and the complainants shall pay the respondents a sum equal to one-tenth of the total taxed costs of the respondents.

"7. In accordance with 1, 2, and 4, the respondents shall pay the claimants the sum of £1,661 (sixteen hundred and sixty-one pounds) damages in respect of the supply in Kensal Town since 1909, including 1916; and in respect of the costs of this branch of the reference, a sum equal to seven-eighths of the total taxed costs of the claimants in the whole of the proceedings before me. But if it should be held that I am wrong in my view of the construction of the agreement concerning the supply in Kensal Town since 1909, the respondents shall not pay the said £1,661 or corresponding costs and the claimants shall pay the respondents a sum equal to seven-eighths of the total taxed costs of the respondents.

"8. With regard to Hammersmith, I find that:—

"(*a*) It is my duty to deal with this question, and I treat it as if it were a separate arbitration, its cost being 1-40th of the whole taxed costs.

(*b*) The supply at Hammersmith is a breach of the agreement of 1900; and Clauses 1, 2, 4, and 5 of this award apply to this case also.

"(*c*) In accordance with 1, 2, and 4, the respondents shall pay the claimants the sum of £50 (fifty pounds) damages in respect of the supply in the Hammersmith district up to and including 1916; and in respect of the costs of this part of the reference, a sum equal to 1-40th of the total taxed costs of the claimants, in the whole of the proceedings before me. But if it should be held that I am wrong in my view of the construction of the agreement concerning the supply in Hammersmith, the respondents shall not pay the said £50 or corresponding costs, and the claimants shall pay the respondents a sum equal to 1-40th of the total taxed costs of the respondents.

"And I further award that the costs of the award be paid by the respondents if my award of £1,900 damages holds good. If not, it shall be paid by the respondents in the proportion of the damages payable by them, the rest being paid by the claimants."

Tramcar Passenger's Interference.

At Sunderland Police Court on the 5th inst., Alfred Coates, an electrical engineer, was charged with having interfered with an electric switch on one of the Corporation tramcars. The Deputy Town Clerk said defendant was a passenger on a tramcar, and while the car was running along Kayll Road the motorman felt it coming to a standstill. He went to the back of the car to ascertain the cause and found the conductress holding the defendant. She complained that the defendant had knocked out the switch. Accused was fined 40s.

The British Engineering Standards Committee and Anglo-American Co-operation.—The American Institute of Electrical Engineers has very cordially accepted the Committee's invitation, and has appointed Mr. H. M. Hobart, M.Inst.C.E., M.I.E.E., as the delegate of its Standards Committee to confer with Sir Richard Glazebrook's Panel Committee on the Standardisation Rules for Electrical Machinery, and it is a pleasure to be able to announce Mr. Hobart's safe arrival in this country. The chairman of the British Engineering Standards Committee, Sir John Wolfe Barry, K.C.B., and Sir John Snell, chairman of the Sectional Electrical Committee, will welcome Mr. Hobart on Wednesday, October 17th, the first day of the Rating Conference.

Moreover, Mr. Hobart's presence in England will afford an opportunity for consultation in regard to the standardisation of electrical apparatus generally, in connection with which much work is being carried out by various Panels of the Committee, especially in respect of motor starters, ship's fittings, fuses, instruments, and instrument transformers, under the direction of Mr. C. H. Wordingham.

As on the previous occasion at the Rating Conference, the Canadian National Committee of the International Electrotechnical Commission has invited Mr. A. P. Trotter to represent it.

WAR ITEMS.

From the Front.—A correspondent with the Forces in France writes as follows, under date October 1st:—"I write to acknowledge with my very best thanks the receipt of the Review, which arrives regularly on Monday evening. It is very much appreciated by 15 electrical men here, and every Monday I am reminded by all of them: 'Don't forget to let me see the Review, will you?' All the articles are read and duly discussed, the 'Lighting and Power Notes' are carefully digested, and finally the advertisements are gone through. Before the arrival of the paper I am always prepared to bet that Silvertown advertisement will be on the back cover, Davis & Timmins's on the last page, and so on. It is quite amusing to see how childlike we all become out here. There is some excuse, however, as the life is rather monotonous. We are getting a nightly visit from the Huns at present, and he doses us liberally with scrap iron; he gets a warm reception every time, though, I can assure you. Once again thanking you on behalf of all the electrical men here for your kindness, and hoping it will not be long before we are all buying our own Reviews again in dear old Blighty."

Chemical Trades After the War.—The Minister of Reconstruction has appointed a committee to advise him as to the procedure which should be adopted for dealing with the chemical trades after the war. Sir Keith W. Price, of the Ministry of Munitions, is chairman of the Committee. It is stated that Dr. Addison has requested the Committee to conduct their deliberations with a view to the creation of some organisation which should be adequately representative of the trade as a whole, and by means of which the trade may be enabled hereafter to continue to develop its own resources and to enlist the closest co-operation of all those engaged in the chemical industry.

Reconstruction in Russia.—An Economic Council and a Central Economic Committee have been instituted, attached to the Provisional Government, for the purpose of drawing up a general plan of economic and labour organisation and for the elaboration of legislative and other measures for the regulation of the economic interests of the country. A sum of 200,000 roubles is assigned for preliminary expenses. The decisions of the Economic Council must be confirmed by the Provisional Government. The Council will be a permanent and salaried organisation. The Central Economic Committee is to co-ordinate measures introduced by separate departments and institutions for the regulation of the economic interests of the country. It will also co-ordinate measures in the different branches of trade and industry. A full statement on the matter by H.M. Commercial Attaché at Petrograd will be found in the *Board of Trade Journal* for October 4th.

The Machinery Trade After the War.—Notwithstanding the release of a large number of the factories now engaged upon war munitions as soon as peace has been proclaimed, there is some doubt about the ability to replace in anything like sufficient quantity or time the immense amount of machinery that will be required. During the last two years it has been difficult to obtain from European manufacturers new machinery of any kind, while, since the United States came into the conflict, the same lack of ability to fulfil South American orders has been manifest from this direction. Important repairs have had to be postponed, and an enormous quantity of existing machinery will have to be "scrapped" and replaced by entirely new installations. A leaf might well be taken, by our larger manufacturers of machinery and equipment, out of the book of our keen rivals, the North Americans, who, in order to grapple with the unprecedented demand after the war, have already formed among themselves what is known as the "Allied Machinery Construction Corporation," which represents a group of leading, but non-competing, manufacturers of construction machinery, and who, taken together, produce all of the main types of such equipment. The group, however, excludes concrete mixing and distributing plants, steam and other power shovels and excavating machines, trench and ditch-digging machines, grab buckets, hoisting engines, light railway lines, light locomotives, and cars of all types, and a great variety of similar special equipment. We have something of the kind already in the machine tool trade, and further developments would undoubtedly prove beneficial. From the inquiries that have been pouring into the different factories for many months past, and which can only be satisfied in full when normal conditions are again restored, it would appear that the greatest demand for South America will be in the following lines:—Machine tools and sugar-cane machinery, all kinds of labour-saving construction machinery, agricultural machinery and implements. It is thought that a few smart and enterprising travellers, representing the great manufacturers of the specialities mentioned, could do a very prosperous business in both South and Central America if a move in combination were made at the earliest moment. One traveller, for instance, might act as the agent of a dozen, or even more, non-competing firms, thus minimising the expenses and securing co-operation for some considerable time to come in the shipping difficulties which will have to be faced and overcome even after the war is over.—*The Engineer.*

The R.F.C.: Women Wanted.—The Women's Army Auxiliary Corps is calling for large numbers of women to work in aircraft repairing depôts, both at home and in France. There are wanted immediately by the Royal Flying Corps 144 fitters (general machine and turners), 52 instrument repairers, 20 acetylene welders, 37 electricians, 12 draughtswomen, 2 tracers, 145 storekeepers for technical stores (knowledge of engine parts and tools), also tinsmiths and coppersmiths. All applications should be made to the Exchanges, where full information will be supplied.

"For Those in Peril on the Sea."—The "Daily Telegraph" is making a Special Appeal on behalf of King George's Fund for Sailors, to which reference was made in our pages a few weeks ago. What we owe to those who go down to the sea in ships in these perilous times, and to the dependents of those who, in the course of duty with the Royal Navy, the Mercantile Marine, and the Auxiliary Services, make the great sacrifice or are maimed—who can count the sum of it? It is by these that we are allowed to have our daily bread, are able to support our forces in the different battlefields, and are protected in our Island Home from invasion. Words cannot express our admiration and our feelings of deepest gratitude, nor can subscriptions to a fund discharge our obligations. Admiration and gratitude our sailors have from all, and right well they know it. Let our readers see to it that through the medium of King George's Fund for Sailors their generosity takes a practical form in the shape of subscriptions sent to the *Daily Telegraph* Office, Fleet Street, E.C. 4. The death roll of the sea in the war has been large indeed. In addition to the losses of men with the Fleet, over 6,000 sailors of the Merchant Navy have paid the great price on our behalf, and the call now is for at least a million pounds more to be subscribed to the fund on behalf of those whose bread-winners have passed within the veil. The stringency of the times must not be permitted to stand in the way of the realisation of that total.

Exemption Applications.—Peterborough Tribunal has granted three months' exemption to A. V. Yeomans (24, C 3), car cleaner, employed by the Electric Traction Co.

At Morecambe, H. B. Atkinson, electrical engineer, appealed for exemption. It was stated that he had gone into a factory, but he had secured a man to do his electrical work at home. The Mayor remarked that Atkinson was given exemption as he was the only electrical engineer in the town to do certain necessary work, and now he had left it for something else. It looked as though he was playing with the Tribunal. The application was refused.

At Fleetwood, an electrical fitter, one of two C 1 men, was given temporary exemption to the end of the year, his employer stating that he had a great many breakdown jobs in hand.

At Ormskirk, the Ormskirk Electric Supply Co. appealed for C. Chester and W. A. Hodson, both single and aged 18, the former B 2 and the latter C 1, who are employed as electrical engineers and fitters. It was claimed that they were in certified occupations, but the Military Representative questioned whether apprentices could be described as skilled men. For the company, it was stated that at the present time they had two engines broken down, and were "in a terrible mess," and that they had offered £3 a week for men to take their places, but had received no applications. Sixteen men had gone, and if these were taken the works would have to close down. Exemption to the end of the year was granted, the youths to join the V.T.C., the company to make further efforts to obtain substitutes.

The Military Representative appealed against the conditional exemption granted at Burnley to five motormen in the Corporation tramway department. Two of them were given final exemption for six weeks, and the others temporary exemption to the end of the year, open.

Malmesbury Rural Tribunal has given exemption until January 15th to C. A. Harvey (32, C 3), electrician on the Earl of Suffolk's estate.

Four months' exemption, with leave to apply again, has been granted to E. W. C. Clayton (C 3), electrician at the New Cross Empire.

At Bath, reviews were made of the cases of two drivers with the Bath Electric Tramways Co., Ltd., G. Dicks (40, Class A) and G. Humphries (35, Class A), both of whom held conditional exemption The Military stated that substitutes had been found, and the certificates were withdrawn.

Messrs. Edwards & Armstrong, electrical engineers, of Cainscross, appealed at Stroud (Glos.) for F. Marston (30, C 1), engineer in charge of the firm's electrical works at Ludlow; J. T. White (28, C 1), in charge of the electrical works at Tewkesbury; J. F. Cuddington, R. G. Young, and E. Preese, apprentices; and R. J. Sweeting (31, B 3), electrician engaged in the repair of motors. Captain Wood said that the company had done extremely well in supplying men to the Army, and having regard to the fact that they were suffering from shortage of labour, he assented to temporary conditional exemption to March 31st, and this was agreed to.

At Stroud (Glos.), Messrs. T. B. Worth & Co., Ltd., Thrupp, appealed for W. Rogers, electrician, passed for general service, and exemption until January 31st was granted.

At Hove, the Military appealed against exemption held by the accountant and chief clerk at the electricity works. He was previously classified B 1, but had been put down to C 1.

Sir Walter Miéville agreed with a suggestion that the man was doing more useful work in his present capacity than if he was to go into the Army. On Major-General Mason intimating that he would be put into a clerical department in the Army, the Mayor observed: "Why not let him remain, if that be so?" The appeal was refused.

At Broadstairs there was a Military review of the case of a storekeeper (31, Class A) with the Isle of Thanet Electric Tramways & Lighting Co., Ltd. He was granted conditional exemption until an efficient substitute is found, and the Military Representative contended that he was not a skilled man, and therefore not in a certified occupation. The manager of the company, Mr. J. A. Forde, urged that the man was a skilled workman, and in a certified occupation irrespective of age. The Tribunal held that the man was in a certified occupation and indispensable to the company, and they confirmed the certificate of exemption.

Appeals were made at Dewsbury for the principal of a local firm of electrical engineers, aged 23, and for two employés, one an electrical fitter (23) and the other the foreman engineer and turner (31). The firm was stated to be engaged upon very important work, including a contract in connection with a military hospital. The principal was granted exemption, the fitter was directed to join up in two months, and the other man in one month.

At Brighton, a local firm appealed for an electrician and fitter (30, C 3), it being stated that the man was doing important work in electrically fitting up local military hospitals. Sir John Blaker (for the Military) urged that the man would be of even more use in the Army, where electrical fitters were badly needed. He would probably be very useful abroad for the Army, not, of course, in the fighting line, but on electrical work. Mr. A. F. Gasston (a member of the Tribunal) said that he believed that C 3 men who had been sent into the Army were being turned out of it now, and Sir John Blaker replied that they must be men with no trade. Mrs. Ashton expressed surprise that C 3 men would be sent abroad. Sir John Blaker: Not into the firing line, and it does not follow that he would go abroad. He could be used on electrical work at home, and if you visit military camps in this country you will be astonished at the big electrical plant they have for different purposes, including the generating of their own electric light. The appeal was allowed.

At Mansfield, there was a Military review of the cases of J. Tranter (29, Class A), inspector, and G. W. Marshall (35, Class A), driver, engaged with the Tramway Co., given conditional exemption in May, 1916. The Military Representative said that the review was made on account of the classification of the men, and Mr. Walker, manager of the company, stated that Tranter was formerly an inspector, but, being a skilled electrician, he was now doing much more important work in looking after the overhead cables. He was prepared to let Marshall go, as they could find a woman to take his place. Tranter's exemption was continued, but that of Marshall was cancelled.

BUSINESS NOTES.

Trade with Brazil: A Consul's Counsel.—The Acting British Consul at Bahia, who has recently visited a number of towns in Brazil has reported giving information respecting commercial conditions which is published in the *Board of Trade Journal* for September 27th. Among the points touched upon are: commercial travellers, openings for trade, and packing. In regard to the first, he finds that at Aracajú, German travellers, even at the present time, are numerous. Complaint is made that, as a rule, British travellers are not accommodating as regards the particular requirements of prospective customers, and the Consul is convinced that in many cases a little tactfulness and resource on the part of travellers would promote trade. One firm stated that prior to the war it received constant visits from German travellers, that, it was buying every year more from Germany, and less from the United Kingdom, and that it is also buying largely from the United States at present. There is a great field for the initiation of business through the agency of travellers in Aracajú, but it is useless to send men who do not speak the language and who cannot, at any rate partially, understand the Brazilian character. With regard to the ironmongery stocked at Aracajú, much of this of British manufacture is superior to any others, but the cheap German goods are preferred, as buyers cannot afford to pay our high prices. He does not advocate that British manufacturers should imitate the inferior goods supplied by German firms, but, after comparing the goods, he states that British manufacturers could probably turn out very serviceable articles at but slightly higher cost than the cheap German goods, and that once British goods were introduced they would hold the market. Articles to last a life-time are not required, but cheap goods which can be readily replaced. With regard to the packing of German goods, the usual thoroughness is shown in ticketing. Tickets on German goods are the same as are used for sales in Germany, but printed in Portuguese, thus saving shopkeepers a great deal of trouble. British goods are ticketed in English, and the shopkeepers have to make Portuguese translations and gum them on. This extra trouble does not facilitate sales any more than conducting correspondence in Spanish. The language to use is Portuguese. In looking through the correspondence of one firm, however, he was gratified to find how much of it from British houses was written in excellent Portuguese, though some was written in English, a matter which always creates difficulty, as English is not usually understood.

"Supertax" on British Trade with Australia.—The *Australian Statesman and Mining Standard* characteristically takes up the cudgels on behalf of British export trade against the Australian Customs Authorities, who are adding 10 per cent. to the amount stated in invoices on certain classes of machinery. We quote from our contemporary's leading article, entitled "Super-taxed British Trade," below:—

"Under a clause in the Tariff Act, originally designed to operate in pre-war conditions of trade, the duties on various engineering and other imports are based on the fair selling value in the country of origin at the time of shipment. In the present disorganised state of the markets in Great Britain, it is probably often difficult to arrive at a close approximation of 'fair selling value.' This consideration does not, however, appear to trouble the Australian Customs Authorities much. They have come to the conclusion that in many instances of late the declared value is understated, and they have accordingly adopted an arbitrary practice of adding 10 per cent. to the amount stated in the invoices on certain classes of machinery. No doubt they have a technical right to do this; but in instances where they show a rigid insistence upon their own judgment and powers, their action conveys, to reputable English firms, an appearance of harshness, and even of sharp practice. The 'loading' of invoices to the extent mentioned presses with considerable severity, and possibly serious injustice, in the case of important electrical contracts which were undertaken before the beginning of the war, and thus before the firms concerned could protect themselves by special arrangements to meet losses through delays, increased costs of production, and other causes. Apart, however, from the question of justice involved in this new rule of the Customs Department, what are we to think of it as an indication of policy—of a policy which not only tends (owing to the conditions of production in England at the present time) to favour foreign manufacturers, but is inconsistent with, if it does not actually stultify, the unqualified assurances given at intervals by our leading political representatives that the Commonwealth would do the utmost in its power to aid Great Britain during the war? Those assurances undoubtedly imply an obligation to assist the export trade of Great Britain, or at least to avoid discouraging and injuring it. By helping to maintain it we can do a service of real, if indirect, importance in the war. . . . To inflict, under an obsolete law, practically penal surcharges on British firms at the Commonwealth Customs Offices, while Australia is handling tens of millions of British money, is worse than ridiculous; it is stupid and humiliating. If the *personnel* of the Customs Department cannot bring themselves to interpret their discretionary authority in a more rational spirit, the matter should receive prompt attention from the Government or the Federal Parliament."

Spain.—There has been formed, at Barcelona, an industrial supplies company styled Sociedad Anonima Abastos Industriales, with a capital of 100,000 pesetas. The company will trade in industrial and agricultural machinery, motors, dynamos and accessory electrical material, manufacture complementary parts, import and export primary materials, and manufactures. The promoters are Messrs. Marimon & Jorda.—*La Energia Electrica.*

Scarcity of Lamps in S. Africa.—The *British and South African Export Gazette* says that electric lamps are so scarce in South Africa that those supplies presumed to be on the water are being disposed of on "to arrive" terms.

Our Commercial Intelligence Service.—At the last meeting of the Advisory Committee to the Board of Trade on Commercial Intelligence, the President of the Board of Trade and Sir A. H. Steel-Maitland made statements as to the reconstitution on a extended scale of the Department of Commercial Intelligence under the arrangements recently concluded between the Board of Trade and the Foreign Office. The Committee also considered questions relating to the promotion of British trade and shipping interests in Latin America, and a report of a special inquiry into the electrical trade in Spain and Portugal. A report to the Board of Trade on the work of the Committee since its appointment in 1913 was adopted; and this being the final meeting, the President expressed to the members his appreciation of the valuable assistance given by them to the Board of Trade during their period of office.—*Daily Telegraph.*

Italy.—Under the style of the Società per lo Sviluppo della Cianamide e di altri Prodotti Chimici, there has been formed at Rome, with commercial and administrative quarters at Turin, a company for the production of cyanamide and other chemical products. The company has interests in the most important foreign cyanamide concerns, and proposes greatly to develop this industry, as well as the chemical industry generally. An influential management committee has been nominated.—*Rivista Tecnica d'Elettricita.*

Lighting Large Areas.—That the arc lamp is by no means out of the running is shown by a leaflet which Messrs. Johnson & Phillips, Ltd., recently issued, giving the comparative running costs of a 2,000-c.p. unit per year of 4,000 lighting hours, with an arc lamp and with half-watt lamps respectively. The 8-ampere "Metroflam" flame arc cost £11 9s. 8d. inclusive and the half-watt lamps (two of 1,000 c.p. each), with renewals, £28 0s. 10d., energy being reckoned at 1d. per unit. The flame arc, in fact, is unexcelled for the economical lighting of large shops and yards where powerful units are required.

Book Notices.—A small journal, called the *Sunic Record*, has been issued by Messrs. Watson & Sons (Electromedical), Ltd., of 196, Great Portland Street, W. 1, dealing with the progress of the X-ray industry, which has been extraordinarily rapid during the war, owing to the universal use of X-ray apparatus at the military hospitals. The first issue contains short articles on X-ray plates, a new exposure meter, dental radiography, &c., and future issues will be supplied regularly to any reader who applies to the firm for them.

"Theory and Calculations of Electrical Apparatus." By C. P. Steinmetz. London: Hill Publishing Co. Price 17s. net.

"Minutes of Proceedings of the Engineering Association of New South Wales." Vol. XXXI. Sydney: The Association.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXVI, No. 9. September, 1917. New York: The Institute. Price $1.

"Heat Drop Tables." Calculated by H. Moss from the formulæ and steam tables of Prof. H. L. Callendar, F.R.S. Published for the Turbine Section of the B.E.A.M.A. London: Edward Arnold. Price 5s. net.

Liquidations.—Worthington Pump Co., Ltd.—This company is winding up voluntarily, with Mr. F. M. Whiting, Queen's House, Kingsway, London, as liquidator. The liquidation is for the purpose of amalgamation with a company with which the Worthington Pump Co. have been associated for many years. The business of the two companies will be carried on as hitherto at the same address, and creditors will be paid in full.

British Continental Electricity Co., Ltd.—A meeting of creditors is called for October 19th, at 21, Finsbury Pavement, E.C. Liquidator, Mr. C. E. Barker.

Trade Announcement.—The Jandus Arc Lamp and Electric Co., Ltd., has changed its name to Arc and General Equipment, Ltd. The alteration has been made because difficulty has arisen from time to time with reference to the name "Jandus," regarding which there was a suspicion that the company was of German origin. We understand that William Jandus was a native of Ohio, U.S.A., and that he no longer holds any interest in the company.

Trade with Switzerland.—Mr. J. B. Beak, the Acting British Consul-General at Zurich, who is visiting this country, will be prepared to interview by appointment representatives of British firms at the offices of the Department of Commercial Intelligence, commencing on Monday, October 22nd. British firms who may desire to have an interview with Mr. Beak are requested to make their applications as soon as possible, and in any case not later than Thursday, October 18th, to the Comptroller-General, Department of Commercial Intelligence, 73, Basinghall Street, London, E.C. 2. Reference number, 46,273/17.

Catalogues.—Messrs. Meldrums, Ltd., Timperley, near Manchester. Two illustrated lists, one (No. 86) giving particulars and pictures of typical refuse-destructor installations for power production; the other (89) dealing with apparatus for chemical and explosives and other works.

A. Gallenkamp & Co., Ltd.—The Public Trustee is inviting tenders for 1,650 preference and 1,341 ordinary shares in this company of laboratory fitters and makers of scientific apparatus, under the Trading with the Enemy Acts.

LIGHTING AND POWER NOTES.

Basingstoke.—Price Increase.—The T.C. has decided to increase the charges for current by 15 per cent. as from September 29th.

Bradford.—The Corporation Electricity Committee has decided to apply to the B. of T. for power to disconnect classes of non-essential consumers in cases of urgent necessity, as suggested by the Coal Controller.

Braintree.—Prov. Order.—The U.D.C. has decided to apply for a prov. order for electric supply, and to oppose, solely to protect the interests of the town, any similar application by the Crittall Manufacturing Co., Ltd.

Coal Economy.—It is reported from Oldham that certain Corporation departments are short of coal, the stock being 10,000 tons under the normal amount, and the Coal Controller is to be interviewed. The question of coal consumption at the Middleton electricity works has been investigated by Mr. Robertson (for the Coal Control Department), and he is in agreement with the proposal to convert the station into a transforming and distributing centre, utilising a bulk supply from Manchester. At Wigan T.C. attention was drawn to the necessity of persuading small power users to convert to electrical driving in the interests of fuel economy.

Continental.—Spain.—Application has been made for a concession to establish a hydro-electric station on the River Hormazuela, in the Isar district, with a view to supplying Isar and Villa Nueva de Argano with electric light.—*La Energia Electrica.*

Consequent upon the result of trials carried out at the Maria Luisa colliery, at Langreo, underground electric traction has been introduced into the majority of the groups of the Sociedad Metallurgica Duro-Felguera. Twelve 26-H.P. locomotives have been installed, continuous current at 220 volts being employed.

Darlington.—Domestic consumers desiring to use electricity for heating, &c., are to be charged 4d. per unit up to the amount consumed for lighting in previous quarters, and 1½d. per unit for excess consumption, the amount to be paid by a consumer to be not less for any six months ending June or December than the amount fixed for lighting, plus 20s. for heating or cooking. This rate overcomes the present difficulty of installing two meters on a consumer's premises.

Derby.—The T.C. has contracted for the repair of the armature of a turbine set—which has broken down after ten years' continual heavy work—at a cost of £725. The new plant which the Council contracted for in January has not yet been received, and an appeal has been made to the public to economise in the use of electricity over peak load periods. An extensive new works which it had been hoped to supply, intends to provide its own electricity, the Government finding the funds, and thus directly negativing the policy of concentrating electric power production which it is supposed to be strongly supporting.

Halifax.—Wages.—The Corporation employés, on Sunday night last, decided that their demand for increased wages, rejected by the T.C., be submitted to arbitration. They ask for a further 6s. per week, to bring their war bonus up to 15s. per week above pre-war wages. In August they asked for 12s. above pre-war rates, and the Committee on Production granted 9s., which was a 1s. higher than the Corporation had previously given. The men now hold that since then employés of other Corporations have obtained better awards.

New Power Station.—Sir John Snell has confirmed the advisability of purchasing the site at Copley for a possible new power station. Though such a station may not be required before 1920, it will be necessary to commence it almost immediately, and the present station in the town is not suited to extension.

Ipswich.—Year's Working.—The annual report of Mr. Ayton, the manager, on the working of the Corporation electricity undertaking during the year ended March 31st last, shows that the units sold advanced from 3,734,158 in 1916 to 4,836,171 in the year under review, the increase being principally in power units, while public lighting supply decreased. The revenue totalled £39,575, while working expenses were £26,825, and, after meeting interest and sinking fund charges, and £370 war service allowances, there was a deficit on the year's working of £172, although the total revenue shows an increase of £5,606 on the previous year. Coal has cost £2,900 more, wages £540, and repairs were £500 higher than in the previous year; taking the whole of the working expenses, they are £5,470 more, or 30 per cent. increase. Mr. Ayton states that great benefit has been experienced from the new coal-handling plant which was put into operation in September last year, and again draws attention to the ash and clinker content, which has reached as high a figure as 30 per cent., while, generally, it has averaged a figure in the neighbourhood of 20 per cent., or nearly double what the same coal gave in pre-war days. He also points out that a lowering of the boiler-house costs would follow the fitting of mechanical stokers to the five marine-type dryback boilers, and considers that this work, as well as the installation of additional plant, must be undertaken as soon as normal conditions return.

Kingston-on-Thames.—The T.C. has appealed to consumers to use less electricity, owing to the demand for energy for power purposes, otherwise it will at times be necessary to cut off the supply from some portions of the borough.

Kirkburton.—Prov. Order.—The U.D.C. has given consent to the Huddersfield Corporation for a prov. order to supply electricity in the district.

Leeds.—Police Indicating Lamps.—The police authorities are about to commence the use, by special constables on point duty at night, of indicating lights. The equipment consists of a white light on the left hand, a red light on the right, and a red lamp on the constable's back; thus he is protected from accident in the rear, and can hold up or wave forward traffic with the hands. The lamps are supplied by a 10-volt accumulator strapped to the back by shoulder-straps and the belt, and the total weight is less than 5 lb.

Lewes.—Street Lighting.—The T.C. has accepted the offer of the electricity company to provide 30 temporary lamps in the town at a cost of £74, and to light them for £10 a year; the use of gas would cost £30 more.

Liverpool.—The proposal to increase the salaries of Corporation officials has led to a considerable amount of feeling. Strong opposition was expressed, but an amendment that no advance be given to officials in receipt of salaries of £500 a year or more was defeated in Council by a large majority. The Municipal Employés' Association, at a mass meeting, passed resolutions protesting against "exorbitant increases of salary to already overpaid officials, while ordinary employés are practically ignored," and demanded an increase of 8s. per week on the war bonus (12s.), to include all employés over 18 years of age, the present bonus with the increase to be converted into wages.

London.—Stepney.—The Electricity Committee recommends that all charges made in respect of electricity supplied to consumers, including meter rentals (except special contracts) be increased by an additional 16⅔ per cent., making a total increase on pre-war rates of 50 per cent., to commence with and include the accounts rendered for the month of October, 1917. An

arrangement has been come to by which the Council will co-operate with the Bethnal Green B.C. in respect to wiring and supply of apparatus for consumers.

Hampstead.—The annual report of Mr. Wyld, the borough electrical engineer, shows that the total sales of energy, 5,202,454 units, though an increase on the previous year, were below pre-war figures. The net income, £76,628, was £9,109 up; the total expenditure, £78,728, showed an increase of £4,500, and a deficit of £2,100 resulted, as compared with a deficit of £6,710 in the previous year. The reduced deficit is due to increased charges in force. During the year a new 1,500-kw. turbo-alternator was burnt out, the makers accepting responsibility; new B.T.H. switchgear has been erected on the site of the Ferranti board while in commission, by the department's staff, and a new cooling tower has been added.

Marsden.—E.L. Proposal.—At a special meeting of the U.D.C., held for the purpose of considering the advisability of applying for a prov. order, Mr. Ernest Schofield advised the Council not to apply for an order at the present time, and the Council decided to ask the Yorkshire Electric Power Co. how soon it would undertake to supply electricity to the district after the war.

Newcastle-under-Lyme.—Linking-up.—The Council has decided that the electrical engineer, in conjunction with the engineer of the Stoke-on-Trent undertaking, shall prepare a scheme for linking-up the two undertakings. A general conclusion in favour of this course was arrived at sometime since at an informal meeting between representatives of the two Corporations.

Oldham.—The restricted output of local cotton mills under the Control Board scheme is believed to be responsible for a decrease in the number of units supplied recently by the Electricity Committee, as compared with last year. The production cost per unit had risen from 0·462d. to 0·516d.

Vehicle Charging.—The Corporation Electricity Department is now prepared with the necessary apparatus for charging electrical vehicle batteries. It is expected that this form of traction will become increasingly popular in Lancashire towns.

Peterborough.—Messrs. Barford & Perkins have voluntarily agreed to pay the T.C. a further increase of 10 per cent. in the price of current supplied to them under contract.

Sheffield.—According to the local papers, the city's electrical undertaking sold during the year ended March last, 48,600,000 units more than in the previous year, an increase of 62 per cent. The revenue increased from £277,580 to £450,088. The total connections increased by 30,000 kw. to 113,870 kw., and applications awaiting connection totalled 21,350 kw. The installation and motor department had a turnover of £55,473, an increase of 50 per cent., and installed over 8,000 h.p. of motors during the year. The electricity department now employs 106 females.

The renewal of the equipment in No. 1 sub-station at the Neepsend power house, at an estimated cost of £2,000, is to be proceeded with.

Stafford.—Land has been purchased by the T.C., at a cost of £1,125, for the extension of the electricity works.

Stoke-on-Trent.—Linking-up.—A preliminary discussion between representatives of the T.C. and Leek U.D.C. is to be held regarding the question of linking-up the electricity undertakings, as well as that of the Newcastle-under-Lyme Council.

Sunderland.—Year's Working.—The annual report of the Corporation electricity undertaking shows that the total revenue for the year was £78,290, and the expenditure £48,821, leaving a gross profit of £29,469, to which there was added a contribution of £2,026 from district fund towards the sinking funds. The net revenue was applied as follows:—Payment of interest and income-tax, £12,914; repayment of loans, £17,424; contributions to capital, &c., £287; renewals, £870. The net revenue for 1915-16 was £30,636. The capital expenditure to March 31st, 1917, was £494,069, and the loan debt, including a debt of £8,305 remaining on superseded plant, was £263,356.

Swansea.—Extensions.—The borough electrical engineer has drawn attention to the necessity of extending the plant at the electricity station on account of increased load. Although he did not suggest that the whole scheme should be proceeded with at the present time, yet he thought the question of installing a new turbine of 3,000 kw. or 5 000 kw., with all auxiliaries, should have immediate attention. It was decided to have a report on the subject.

The Electricity Committee has received a report from the borough electrical engineer of a meeting of the Western District Joint Committee on Linking-up. Discussion ensued at the meeting over questions as to the best way of dealing with the intervening mains between adjacent supply authorities (which in this particular case would come specifically under the powers of the South Wales Power Co.), and Mr. Chamen observed that a power company might erect and maintain on such terms as either a rental paid or transmission charges. Mr. Burr said the links would cost the Swansea Corporation some £15,000. The proposed routes of the mains between Swansea and Llanelly and Swansea and Neath were also discussed at the meeting, and Mr. A. H. Thomson (engineer, Neath) estimated that the cost of the Neath link, so far as his Council was concerned, would be some £10,000. The matters were adjourned for further consideration, Mr. Chamen stating that he would be very pleased to commence negotiations at once with the parties concerned. Mr. Burr's report was adopted.

The Electric Lighting Committee has approved of a recommendation of the Borough Technical College Sub-Committee that Mr. J. W. Burr, the borough electrical engineer, undertake, as a temporary measure, the teaching of the advanced class in electrical engineering at the Technical College.

Walsall.—The Electricity Committee has decided to reconsider the matter of electricity charges three months hence. A Committee on Production award involves the department in an additional wage expenditure of £400 a year.

The erection of the second turbo-alternator is completed, but, owing to trouble with a circulating pump, the alternator is not yet in commission. The Committee has approved a schedule of plant at the Wolverhampton Street generating station about to be advertised for sale.

Wednesbury.—Annual Accounts.—The report of the year's working of the electricity undertaking shows receipts amounting £12,386, as compared with £10,860; working costs to £11,030, as compared with £8,331, leaving a gross profit of £1,356, as against £2,529 in the previous year. Loan and other charges totalled £3,818, leaving a deficit on the year's working of £2,462, which, with £1,681 debit balance brought forward, makes the total deficiency £4,143. The reduction of public lighting, and the increased costs of fuel and Mond gas, are the principal causes of the unsatisfactory result.

Wharfedale.—The Burley Council, in considering the Yorkshire Power Co.'s application for a prov. order, has asked the company to agree to various conditions, including a purchase clause; the Menston Council favours electric lighting.

Wolverhampton.—Price Increase.—The Electricity Committee has decided that, in addition to the 20 per cent. increase in the charges for electricity already sanctioned by the Council, a further 10 per cent. advance be made in the charges to consumers of electricity for power purposes who are paying the pre-war price of 1d. per unit and under (plus the 20 per cent. increase), such further increase to date as from October 30th.

Worcester.—Price Increase.—The City Council has decided to add a further 10 per cent. to its lighting, heating and power charges, making 20 per cent. on pre-war rates. The 10 per cent. increase will produce £16,000 towards a deficiency of £24,000.

The City Council has granted increased salaries to its assistant electrical engineers and a war bonus to each member of the staff; it has also revised the wages list, and the increases are estimated to cost £600 per annum.

TRAMWAY AND RAILWAY NOTES.

Accrington.—Mr. H. Pilling, Corporation tramway manager, in discussing the award just made by the Committee of Production to Lancashire tramway workers, states that previous to the latest grant the war bonuses paid to the local tramway workers exceeded £3,000 per annum, and the last award will mean an additional £900 a year. This is equivalent to a rate of 4d. or 5d. in the £. Some of the Accrington workers, who number 1f6, will receive as much as 14s. or 15s. per week for overtime. As an alternative to this advance in wages, the question of the increase in fares will have to be seriously considered. Before the outbreak of the war the cost of tramway tires, &c., was much less than now; material for which £1,000 was paid prior to the war is costing £3,000.

Bootle.—Tramways Agreement.—A lengthy discussion took place at the T.C. on the new tramway agreement with Liverpool. Alderman Booth, explaining the reason for the agreement, said that before the war it was decided that the entire system needed reconstruction, but the war held up the matter. Liverpool claimed over £30,000 for loss of traffic, damage to cars, &c., to the end of 1916, and, after deciding to go to arbitration, it was arranged to settle the matter between the two Corporations. The new lease would run for 25 years from July 1st last, at a rental of £500 a year for the first six years and £1,000 a year after, Liverpool taking over the debt of £20,000, less the reserve fund of £700. In case of future extensions, Liverpool had agreed to pay £200 a mile. Liverpool would pay £43 per mile yearly for the upkeep of the overhead equipment. Councillor King said Bootle were selling their birthright to Liverpool, and they would be sorry for it, and Councillor Randall considered that they had been bluffed into the agreement. The Council, however, sealed the new agreement.

Continental.—Spain.—Application has been made for a concession to establish an electric tramway in Guadalajara, running from the railway station to the Plaza Mayor of the city.

The success which has attended the public subscription of capital, brings the realisation of the Oviedo electric tramways scheme into measurable distance. The work will be divided into six sections of 17 km. Later some 12 branches will be constructed to distant localities, thus completing the Asturias tramway network.

The concession granted to Pedro Garcia-Faria, on June 3rd, 1892, for the construction of an underground electric railway in Madrid is declared to have lapsed, but an appeal may be lodged. The

above concession should not be confounded with that of the Central-Metropolitano, granted in September, 1916; the latter is a modest scheme of only 4 km. extent, out of an eventual aggregate of 14 km.

Doncaster.—Cheap Fares.—At the T.C. meeting, last week, an attempt was made to upset the decision of the Council-in-Committee to support the Tramways Committee's recommendation for the withdrawal of all workmen's and other cheap return tickets, owing to the present high cost of working. Councillor Warren, who moved that the minutes be not confirmed, admitted that on September 17th he had himself voted in favour of the abolition of the tickets, but he now thought there was another way out. He said last summer, on considering the tramway estimates for the present year, the price put down for current was 1¼d. per unit plus, 10 per cent. war charge, and that worked out at 4s. 7d. per 40 units. In May this year a sliding scale for large consumers had been brought forward, based on seven-tenths of a penny per unit, whilst the coal was 10s. per ton. Provision had also been made for a fluctuation of coal on the basis of $\frac{1}{100}$ths of a penny for every 6d. increase per ton in the price of coal. Based on to-day's price, he worked that out to be 3s. 1d. for 40 units. He suggested that this margin was more than enough to make up the deficiency with which the tramways would be faced on account of increased expenditure, without taking such a drastic step as withdrawing the tickets. Councillor Marshall ably defended the Tramways Committee's reasons for urging the withdrawal, and the meeting decided, by 20 votes to 8, on the final adoption of the recommendation.

Ipswich.—Year's Working.—The annual report of the Corporation's tramway undertaking shows a total revenue amounting to £25,566; working expenses amounted to £21,922 and war service allowances to £587, and, after meeting interest and loan repayments, there was a deficit on the year of £2,671, as compared with a profit of £2,757 in the previous year. The loss has been taken from the surplus brought forward of £3,700, leaving a credit balance of £1,028 to be carried forward. The passengers carried numbered 6,246,820 and the car-miles were 567,503, which compare with 6,798,589 passengers and 620,115 car-miles in 1916. The reserve or renewals fund now stands at £24,053.

London.—L.C.C.—The reduction in ticket transfer facilities, referred to in our last issue, is stated to have greatly increased the congestion at certain points on the tramway system, involving delay and overcrowding. According to the *Times*, it is being urged that the cost of reducing the loss by fraud under the old arrangement will exceed the possible saving.

Now that fares have been increased on the Council's tramways, the Stepney B.C. is inserting the tramways in a provisional valuation list with a view to increasing the rateable value.

Lytham.—The Council has decided to inform St. Anne's Council that it has been advised that the consent of the B. of T. to the supply of electrical energy to the Tramways Co. in the Urban District of Lytham should be applied for by St. Anne's, with the consent of Lytham Council, such consent to be effective only during the existence of the agreement between the two Councils.

Manchester.—Increased Expenditure.—Some interesting figures were given at the City Council last week; Alderman Bowes, chairman of the Tramways Committee, said the recent award of the Committee on Production to the employés in that department would mean an increased cost of £78,780, which, with the war advance, amounted to £90,000. The award given on September 27th to the tramway and vehicle workers would cost £27,040, and, with the award given to the Workers' Union on the same date, the total was brought up to £119,086. The undertaking could not stand such a heavy burden without doing something to increase the fares, and the Tramways Committee would take the matter into consideration at the earliest opportunity. However much they disliked higher fares, they had reached a point at which it was absolutely impossible to go on paying their way on the present fares. It is not expected, however, that the increases will be of a very drastic character, a return to the scale obtaining before the stage extensions in 1913 being the scheme mostly favoured.

Mansfield.—The Mansfield and District Light Railway Co. has applied to the B. of T. for an extension of time until April 9th, 1921, for the completion of five lines of tramways in Sutton-in-Ashfield and Skegby.

Nelson.—Suggested 'Buses.—The Corporation Tramways and Electricity Committee has had under consideration the provision of passenger-carrying vehicles, to be run in the higher portions of the town in conjunction with the existing light railways. The Sub-Committee inspected the electric omnibuses at Lancaster, but it was decided to defer the matter for the time being, the view being that the type of vehicle was unsuitable for gradients, and that there was prospect of an improvement after the war.

Newcastle-on-Tyne.—Assessment.—At the Quarter Sessions, on October 6th, Mr. Maynell, representing the Corporation, asked for a consent order regarding the tramway assessment for 1915, 1916, and 1917, and this was granted. The toal figures had been agreed between the parties, and the order would reduce the assessment in accordance with the figures. The matter was referred to in our last issue.

New Zealand.—Electric Vehicles.—Mr. W. E. Stark, the Christchurch city electrical engineer, recently declared himself convinced of the future of the electric vehicle, predicting that within five years' time after the war Christchurch will have a fleet of 500 cars. At present there are nine representative "electrics" in use in the city, which have given every satisfaction.

Sunderland.—Year's Working.—The report of the year's working of the Corporation electric tramways undertaking shows that the total revenue was £85,513, and the expenditure on traffic, power and management expenses £49,970, leaving a gross profit of £35,543, as compared with £34,669 in 1915-16. The gross profit was applied as follows:—Interest and income-tax, £10,650; repayment of loans, £13,368; contributions to capital, &c., £427; borough fund in aid of rate, £5,000; and the balance of £6,098 was transferred to the renewals fund. The capital expenditure to March 31st, 1917, was £307,120, and the loan debt £145,311; the amount to the credit of renewals and reserve funds was £56,711.

Swansea.—New Lease.—The Committee has agreed to proposals in regard to a new tramway lease. The reason for the new lease is because of the peculiar state of the law governing the Swansea tramways and light railways. These are held under various leases, and as each lease expires it has to be renewed, with the result that it is not until 1980 that the Corporation is able to exercise its powers of purchase of the whole system. In 1911, however, negotiations were opened, and it was agreed to equate the varying periods, so that the Corporation can exercise its powers in about 20 years' time. An agreement was also come to by which there should be one lease only of the existing system, and certain new sections of tramways and light railways then under construction. It is in pursuance of that agreement that the new lease is about to be completed. The fixed rental comes to about £6,000 per annum.

Walsall.—The Tramways Committee has accepted an offer of the services of boy scouts to assist conductors during busy hours.

CONTRACTS OPEN AND CLOSED.

OPEN.

Dublin.—November 1st. G.N. Railway Co. (Ireland). Six or twelve months' supply of general stores (including several electrical items). See "Official Notices" October 5th.

Grimsby.—October 29th. Corporation. House service boxes and house fuse-boxes and fittings. See "Official Notices" to-day.

London.—Office of Works.—October 12th. Steam tubes and fittings for twelve or six months. Secretary, H.M. Office of Works, Storey's Gate, S.W. 1.

Morecambe.—October 15th. Electric Traction Committee. Supply of electrically-driven omnibus. See "Official Notices" October 5th.

CLOSED.

Bradford.—Having received a report as to difficulty in obtaining delivery of pinion wheels from the present contractor, the Tramways Committee has decided, without interfering with the existing contract, to accept the offer of the British Hele-Shaw Patent Clutch Co., Ltd., for 162 steel pinions, at £212.

Derby.—T.C. Repairs to turbine armature: Parsons, Ltd., £725.

London.—Marylebone.—Electricity Committee. Grab for the electricity works travelling crane, £500: Goodacres and Sons, Ltd.

Stepney.—The Electricity Committee has accepted the following offers for coal:—

Bradbury, Son & Co.—5,000 tons Clifton peas, &c., at 24s. 6d. per ton.
Foster & Co.—5,200 tons Bolsover nutty slack, at 21s. 7d. per ton; 1,000 tons Arley D.S. nuts, at 25s. 4d. per ton; 600 tons Snibston slack, at 21s. 8d. per ton; and up to 100 tons per week of Coombs Wood beans, at 22s. 10d. per ton.

Sheffield.—City Council:—

Ferguson, Pailin & Co., Ltd.—One 500-amp., 2,000-v. switch panel.
W. T. Glover & Co., Ltd.—Cable (revised price schedule).

Stafford.—Gas and Electricity Committee. J. Dallow and Sons, Blackheath, at £1,087, new boiler-house and pump-room for the electricity department.

Stretford.—U.D.C. Accepted tenders:—

Underwood (Manchester), Ltd.—One 25-h.p., 500-volt d.c., shunt-wound, totally-enclosed motor, £175.
James Hodgkinson (Salford), Ltd.—One 66-in. diameter special induced-draught fan, £204.

Transformer Contracts.—The following orders for transformers have been received by Messrs. Ferranti, Ltd. :—

Glasgow Corporation.—Sixteen 1,875-K.V.A. single-phase transformers.
Birmingham Corporation.—Seven 1,250-K.V.A. single-phase transformers.
Barrow-in-Furness Corporation.—One 400-K.V.A. three-phase transformer.
Manchester Corporation.—One 125-K.V.A. three-phase transformer.
British Thomson-Houston Co., for Shoreditch Borough Council.—One 1,650-K.V.A. three-phase transformer for use with a rotary converter.

Wolverhampton.—Corporation. Accepted tenders :—

Strachan & Henshaw.—Coal-conveyor plant for the electricity works, £1,642.
Gibbons Bros.—Steel structure for additional coal-conveyor plant, £926.
Reyrolle & Co.—One 5,000-KW. generator panel and two 2,000-KW. feeder panels, £1,950.
Stirling Boiler Co.—Boiler equipment complete with stokers, fans, chimney, &c., £19,822.
British Thomson-Houston Co.—5,000-KW. turbo-alternator, £17,803.
Allen & Co.—Condenser body, £6,083.
Willans & Robinson.—Condenser plant auxiliaries, £3,729.

FORTHCOMING EVENTS.

Electro-Harmonic Society.—Friday, October 12th. At 8 p.m. At the Holborn Restaurant (Venetian Chamber). First smoking concert of the season.

Junior Institution of Engineers.—Friday, October 12th. At 7.30 p.m. At 39, Victoria Street, S.W. 1. Paper on "Scale Prevention in Water-cooling Systems" (illustrated by experiments), by Mr. H. Sampson Wills.
Monday, October 15th. At 7.30 p.m. At 39, Victoria Street, S.W. 1. Paper on "Mechanical Arms," by Mr. E. W. Hobbs.

Birmingham and District Electric Club.—Saturday, October 13th. At 6.30 p.m. At the Swan Hotel, New Street. Ladies' night.

North of England Institute of Mining and Mechanical Engineers.—Saturday, October 13th. At 2 p.m. At the Wood Memorial Hall, Newcastle-on-Tyne. General meeting.

Institution of Mechanical Engineers.—Friday, October 19th. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. "A Comparison of the Working Costs of the Principal Prime Movers," by Mr. Oswald Wans.

NOTES.

Organisation of Power Station Engineers.—The meeting of the Midland Electric Power Supply Engineers' Association, announced in our issue of September 28th, was held at Birmingham, on October 5th. Representatives were present from other large Midland towns, and the temporary Committee was strengthened by their inclusion. Detailed information can be obtained from the hon. secretary, Mr. P. J. Burgess, 21, Geraldine Road, South Yardley, Birmingham.

Association of Electrical Station Engineers.—On Friday last a meeting was held at St. Bride's Institute of central-station staff engineers, at which representatives of 16 central stations in the London area agreed to support the A.E.S.E.

A similar meeting was held in Manchester on October 3rd of the central-station staff engineers of Manchester and district. The following resolution was carried unanimously :—"That this meeting of staff engineers in the Manchester district being convinced that collective organisation is an urgent necessity, expresses its entire agreement with the objects of the A.E.S.E., and resolves to hold a further meeting to discuss the various details in connection with the Association as soon as possible." During the last few days a form has been extensively signed by London central-station staff engineers protesting against the Electrical Trades Union negotiating with regard to rates of pay, &c., for central-station staff engineers. The number of signatures received to date gives the A.E.S.E. a very strong position in the matter. Any engineers interested can obtain full particulars from the Hon. Secretary, A.E.S.E., 26, Little Park Gardens, Enfield.

London Power Station Employes.—The Stepney B.C. Electricity Committee has appointed two representatives to serve, together with the borough electrical engineer, on a body, the formation of which is recommended by the Associated Municipal Electrical Engineers to consider working conditions, rates of pay, &c., of employment in the power stations of London.

Marylebone Electricity Committee having considered a communication from the Chief Industrial Commissioner, Ministry of Labour, concerning war wage grants in municipal power stations in the metropolis, and the possibility of uniformity, has informed the Commissioner that it has from time to time, and as late as August last, been in negotiation, and has come to satisfactory arrangements, with employés of the Electricity Department, through a representative of the National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen and Electrical Workers, and that it sees no reason to re-open the question at the present time. The Committee entirely agrees with the suggestion as to establishing uniform payments and conditions for employés in London power stations.

Instruction in Technical Optics.—At the last meeting of the Governing Body of the Northampton Polytechnic Institute, Prof. Frederic J. Cheshire, Director of the Department of Technical Optics in the Imperial College of Science and Technology, South Kensington, was appointed Honorary Head of the Technical Optics Department of the Northampton Polytechnic, in accordance with the schemes of the Board of Education and of the London County Council for the provision of instruction in technical optics.

Tyneside Power Supply Data.—At a meeting of Newcastle-upon-Tyne Chamber of Commerce, on the 3rd inst., Mr. Turnbull, of North Shields, representing the Electrical Section of the Chamber, said that Section had been requested by the Board of Trade to supply evidence in regard to the use of electric power in the district, and the Section asked for the appointment of a Sub-Committee from the Council to assist. Among the information required was as to the saving in the cost of power by the use of electricity, and the effect upon industrial development, convenience of electricity when adding new machinery, and its adaptability to awkward situations, and the possibility of the use of waste heat from coke ovens and blast furnaces. Messrs. E. L. Beckingham, H. Pyle, and B. C. Browne were appointed to act.

A New Electrical Furnace.—A new type of electric furnace has recently been constructed in Sweden, which is especially useful as an economical small unit for crucible works and steel foundries. In addition, it may be made suitable for copper smelting, glass melting, and for melting various alloys. The furnace is of the arc type, but differs from existing ones ; it is cylindrical, with closed ends. Two of the electrodes enter the furnace horizontally, one in the centre of each end ; the third electrode is vertical, entering at the top in the centre.

Heating is by radiation from the arcs, but their deflection upon the bath is also of material assistance. The furnace is built with a horizontal cylindrical steel shell, rolling in cradles or tilting round a horizontal diametric axle. It is lined with acid, basic, or neutral material, according to the work for which it is intended. The currents entering at each end through the horizontal electrodes neutralise each other, but the returning current into the central electrode generates a field of force which deflects the arcs downward towards the bath. This is the essential feature of the new furnace, which differentiates it from those hitherto used. The points of the electrodes are usually kept 6 to 12 inches above the surface, but they can be adjusted as required. The furnace is adapted for work on cold or liquid metal, and the electrodes can be drawn back while the furnace is being charged. The circular form of the furnace is one of its greatest advantages. The radiant heat from the free-burning arcs is reflected on to the bath from the entire mirror-like incandescent inner surface of the vault. Yet the arcs are at such a distance from this roof that the danger of melting is minimised. A sound point in construction is that there is no break between the roof, the side walls, and the bottom, all being built together in one curve. To enable the furnace to be relined, the shell is in halves, bolted together. The electrodes, of graphite, are held together in a loose fit in water-cooled, insulated phosphor-bronze boxes, those for the horizontal electrodes being adjustable also in the vertical plane. Once the arcs are adjusted, it suffices to advance the side electrodes by about 1 in. per hour.—*Scientific American.*

U.S. Eight Hours' Law Suspended.—According to the *Labour Gazette*, the Orders for suspending the Eight Hours' Law were effective from date of the promulgations in March and April last, and they are operative "during the pending emergency and until further orders." In addition to applying to Government contracts, they apply to mechanics and labourers employed on work which, in the judgment of the Secretary for War, is important for purposes of national defence.

Coal Shortage Effects in Switzerland.—In order to effect greater economies in coal and electrical energy Swiss shops are to be closed at 7 p.m. Kinematograph and variety theatres are to be closed 12 days a month. Hotels and boarding houses will be allowed to heat only 25 per cent. of their rooms, or in exceptional cases, 50 per cent. Mountain hotels will be exempt from this rule.—*Times.*

The Electrolytic Production of Zinc.—Among the important metallurgical developments in British Columbia during last year was the completion and commencement of operation of the electrolytic zinc-producing plant, dealing with raw ore, at the works, at Trail, of the Consolidated Mining and Smelting Co., towards the beginning of 1916. The plant was in continuous work during the remainder of the 12 months, and is now turning out from 25 to 30 tons of spelter per day, which means that from 150 to 200 tons of ore are being treated daily. The total production of spelter by the new plant during last year is returned at approximately 6,810 tons. The installation was designed primarily to treat the complex zinc-lead ore, of which large reserves have been proved. The ore is roasted, and then leached with a solution of weak sulphuric acid ; this dissolves out the zinc, which is then precipitated in electrolytic tanks. The lead and low silver contents of the ore remain as an insoluble residue from the leaching process, and are sent to the lead furnaces for smelting. This process enables the zinc contents of the ore to be saved—at least, in a large part—and also makes a much better product for the lead-stacks than the crude ore. The cost of producing zinc by this method is stated to be about the same, or possibly a little higher, than by fire smelting, but the latter process could not be used with the particular ore in question. At the beginning a number of difficulties were met, but they were eventually successfully overcome, these being, perhaps, necessarily incidental to the standardisation of the production in a large way of electrolytic zinc, and it is expected that, as the staff becomes more familiar with the operations, further improvements will be effected. Before the plant was completed further contracts, at the request of the Imperial Munitions Board, were entered into for an increased supply of zinc, which rendered necessary very large additions to the installation as originally designed, but the completion of which has been delayed owing to the difficulty experienced in obtaining deliveries of electrical machinery.

Industrial Reconstruction.—A scheme has been elaborated for a Council for the Study of Industrial Reconstruction, and a meeting is shortly to be held at which the proposals advanced by those prominently associated with the movement will be explained. A manifesto signed by a large number of well-known professors, editors of trade journals, and officers of trade associations sets forth in fair detail what the scheme is. We give some extracts below, and would refer readers who may be sufficiently interested in the matter to desire further information to the Secretary, Mr. F. W. Galton, care of Messrs. Benn Bros., Ltd., 8, Bouverie Street, E.C. 4. It is considered that to meet the urgent needs of the times, increased efforts to develop our industries will be necessary on the following lines :—

1. The mobilisation of each industry for common action.
2. A greater degree of co-operation between manufacturers.
3. Co-operation between labour and capital, and the avoidance of industrial strife.
4. A more complete association between scientific institutions and traders.
5. Education better adapted to our commercial needs.
6. Each industry to be studied as a whole, and freed from unnecessary internal competition.
7. Every trade to present a united front to foreign competition.
8. Output regarded as a duty by both capital and labour.
9. Encouragement by the Government of the activities of traders with a minimum of interference.

The necessity for greatly increasing the national output is so imperative that some national scheme which shall ensure the securing of these objects is considered necessary.

It is suggested that a national organisation, along the lines of the Whitley Report, should be established, which will retain all the sterling qualities of our individualistic system, and add ordered force to ensure greater activity; also that such an organisation will need to provide for the representation of all classes of persons engaged in a given industry; that industry should, therefore, be enfranchised, and every man and woman, employer and employed, given a vocational or trade vote, by means of which this representation would be effectively realised; that every citizen should have the right to register with some approved Trade Association or Trade Union, and thus an Industrial or Vocational Register properly classified would be produced; that Trade Councils should be elected in each industry from the Trade Associations and the Trade Unions, upon a truly representative basis, so as to be able to speak in the names of the whole of their respective industries; that all questions between the Government and a given trade should be delegated to the Council of that trade to deal with; and that questions of output, education, trade schools, scientific research, export, wages, profits, markets, tariffs, &c., &c., should be settled in each trade by the Council of that trade, and national funds spent upon these matters dispensed through the Trade Councils.

Feeling that the time has come when the discussion of these matters should take a more detailed and practical form, those responsible for the manifesto have put forward various heads as a basis for further study.

These heads are concerned with the organisation of separate trades; a Government Department to promote or encourage trade; Trade Unions and Associations; Trade Councils (consisting of representatives of Trade Associations, Trade Unions, and aldermen elected by the Council on the nomination of Government Departments; and, lastly, work. "A very large proportion of the work now badly done by various Government Departments could be delegated to these Trade Councils, and would be more effectively performed. Reconstruction work, which largely depends upon industrial prosperity, could be undertaken by these Councils with a better prospect of success than it would have in any other way."

Generally, the scheme involves the establishment of a complete, new system of trade government comparable to our existing system of local government, with a Ministry at the head with powers similar to those of the Local Government Board, controlling numerous Trade Councils with powers comparable to those of existing County Councils. It recognises the essential principle that industrial interests should be grouped by trades, and not by localities.

National Insurance (Unemployment) Acts, 1911-1916.—The following are further decisions of the Umpire :—Contributions are payable in respect of :—

2,388 X. All workmen engaged in making, including welding, stamping and machining, ferrules for water-tube boilers.

This decision amplifies decision A 1,263 (*Board of Trade Journal* of January 30th, 1913).

2,389 X. Workmen described as painters employed by a firm of manufacturers, and engaged wholly or mainly in painting street lanterns or steel book-stacks at the works.

The Production of Nitrates in the United States.—The U.S. War Department has announced that the Nitrate Supply Committee recommends the Government to use the synthetic ammonia process of the General Chemical Co., and to allocate out of the £4,000,000 nitrate supply appropriation a sum of £600,000 for this purpose, to build a plant having an output of 60,000 lb. of ammonia per 24-hour day, as well as a sum of £120,000 for a plant to oxidise ammonia to nitric acid and concentrate the acid, the output being equivalent to 24,000 lb. of 100 per cent. nitric acid per day.

A further sum of £40,000 is asked for, to experiment with a view to the industrial development of the Bucher process for the production of ammonia which is owned by the Nitrogen Products Co. in the States. The installation of by-product coke ovens is also to be accelerated. The decision as to the more extensive installation of nitrogen fixation processes and water-power development in connection therewith is to be postponed until the plants above mentioned are in operation. A reserve of half a million tons of Chile saltpetre is to be accumulated as a matter of urgency.

Volunteer Notes.—County of London Volunteer Engineers (Field Companies).—Headquarters, Balderton Street, Oxford Street, W. 1.

Orders for the week, by Lieut.-Colonel C. B. Clay, V.D., commanding :—

Officer for the Week.—Second Lieut. E. A. Ullmann.

Monday, October 15th.—Drill and Elementary Bridge Construction for No. 3 Company, Left Half Company, 6.30. Signalling Section, 6.30. Recruits' Drill, 6.30.

Tuesday, October 16th.—Physical Drill and Bayonet Fighting, 7.30.

Wednesday, October 17th.—Drill and Elementary Bridge Construction for No. 1 Company, 6.30.

Thursday, October 18th.—Drill and Elementary Bridge Construction for No. 2 Company, 6. Signalling Section, 6.30. Ambulance Section, 6.30.

Friday, October 19th.—Drill and Elementary Bridge Construction for No. 3 Company, Right Half Company, 6.30.

Saturday, October 20th.—Commandant's Parade for Route March and Drill. Parade at Headquarters, 2.45 p.m. Uniform. A and B N.C.O.'s and Men are reminded that one Route March per month is compulsory.

Musketry.—The Range at Belvedere Road will be open every Tuesday, Wednesday, and Thursday evening from 5.30 to 7.

Medical Examination.—The Medical Officer will attend at Headquarters for this purpose every Thursday at 6.

(By order) Macleod Yearsley, *Capt. and Adjutant.*

Institution and Lecture Notes.—The Faraday Society.—A general discussion on "Pyrometers and Pyrometry" will be held on Wednesday, November 7th, at 8 p.m., in the rooms of the Royal Society of Arts, John Street, Adelphi, London, W.C. 2.

Sir Robert Hadfield, Bart., F.R.S., President of the Society, will preside over the discussion and deliver an introductory address.

Dr. E. F. Northrup (Trenton, N.J.) will send in a communication entitled "High Temperature Production and its Measurement."

Dr. Ezer Griffiths and Mr. F. H. Schofield, B.A., B.Sc. (National Physical Laboratory) will read a paper on "Pyrometer Standardisation."

Mr. R. S. Whipple (Cambridge) will read a paper on "The Advantage of Burying the Cold Junction of a Thermo-couple as a means of Maintaining it at a Constant Temperature."

Mr. Richard P. Brown (Philadelphia) will read a paper and give a demonstration on "The Automatic Control Measurement of High Temperatures."

Prof. J. O. Arnold, F.R.S. (Sheffield) will speak on "Pyrometry Applied to the Hardening of High-Speed Steel."

Mr. Cosmo Johns (Sheffield) will speak on "Determining the Temperature of Liquid Metals by Means of Optical Pyrometers."

Dr. W. H. Hatfield (Sheffield) will read a paper on "Pyrometry from the Standpoint of Ferrous Metallurgy."

Mr. H. Watkin (Stoke-on-Trent) will read a paper on "The Measurement of High Temperature by Means of Pottery Materials."

Mr. C. R. Darling will read a paper on "Base-Metal Thermo-Electric Pyrometers."

Dr. J. W. Mellor, Mr. F. Twyman, and Mr. G. E. M. Stone will also contribute to the discussion.

Instruments will be exhibited by Mr. Richard P. Brown, the Cambridge Scientific Instrument Co., Messrs. Hadfields, Ltd., Mr. H. L. Heathcote, Mr. Robert W. Paul, and Messrs. Siemens Bros. & Co., Ltd.

Wages of Foremen Engineers.—A deputation from the London Association of Foremen Engineers waited upon the Ministry of Munitions, on Tuesday, to call attention to the rate of wages paid to foremen in the engineering trades, which was stated to be in many cases lower than those received by even unskilled hands. It was said that in many cases they had the sympathy of their employers, but such employers were helpless without the sanction of the Ministry. The deputation was informed that although any increase in wages in a controlled establishment of any members of the staff must be approved, it was recognised that the foremen did important work. The merits of different cases varied largely, but the Ministry of Munitions was in sympathy with those foremen who did special work, and would not raise any objection in such cases to any advance of salary which might be agreed upon between employer and employé. In asking for such approval, the nature and extent of the extra work should be clearly stated. If the foreman could not agree with his employer as to the amount of increase, he could apply to the Minister of Labour, Industrial Department, and an arbitrator would be appointed.—*Morning Post*.

Appointments Vacant.—The Chief Engineer, War Department, Salisbury, is advertising in our pages to-day for competent men, who are required immediately to fill the following positions :—Electrician, mains engineer, shift engineer, engine driver, fitter, fitter driver, jointer, wireman, and wireman's mate. Electrical fitter (50s.), for Chester Corporation tramways; oil engine and dynamo attendants (35s. to 40s.), for the power stations in the Northern Command; Londonderry Corporation wants a charge engineer for its generating station. See our advertisement pages to-day.

The Ventilation of the Tube Railways.—In an interesting communication to the *Times*, General Sir Desmond O'Callaghan refers to the crowding of the tube railway stations by aliens during air raids, and suggests that if a bomb deranged the ventilating arrangements these people might be suffocated. There is, however, little danger on this score; the tubes are not all supplied with power from the same source, and it would have to be a very lucky shot indeed that would cut off the supply from even a portion of the system for a long period. Moreover, there is an immense volume of air in the tunnels, which is always more or less in movement, and the stairways are open to the atmosphere at the surface.

Inquiries.—Makers of "Crosby" clamps and wood separators for storage battery plates are asked for.

The Australian Strike.—Additional restrictions on coal and power for industrial purposes have thrown 13,000 more hands out of work in Victoria. Oil engines, and even motor-car engines, are being used to run machinery.—*Times.*

London Electrical Contractors' Dinner.—We read in the *Electrical Contractor* that the London Section of the Electrical Contractors' Association will hold a dinner on November 7th at Tricity House, Oxford Street. A paper by Mr. A. F. Berry on "Electric Cooking" will follow.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. W. H. Shorter, superintendent in the sales department of the Marylebone electricity works, has obtained a commission in the R.F.C.

Mr. T. Roles, city electrical engineer, Bradford, who has been "lent" to the Coal Controller's Department for the purpose of explaining to Yorkshire local authorities the Controller's scheme of coal economy, has now got to work on his new task, and has commenced operations on his own city and Leeds and Halifax.

West Bromwich T.C. has increased the salary of the borough electrical engineer, Mr. W. A. Jackson, from £400 to £500 a year.

Canterbury T.C. has increased the salary of the electrical engineer, Mr. Blascheck, from £350 to £400 per annum.

Mr. M. Bell has been appointed superintendent of the generating station at the West Bromwich Corporation electricity works at a salary of £300 a year.

The Bath Corporation has increased the salary of Mr. A. R. Shapley, the deputy city electrical engineer, by £25 per annum.

Mr. E. P. Austin, chief assistant engineer at the Chesterfield electricity works, has been appointed chief electrical engineer at the Sheepbridge works. He has held the position at Chesterfield since 1906, and the Electricity Committee, in accepting his resignation, have placed on record their appreciation of his energy and ability. A successor will be appointed at £230 per anum.

The Chester Electricity Committee has granted leave of absence to Mr. Percy Heard, who has been called up. It is recommended that, as a temporary measure, Mr. G. E. Swift, the mains superintendent, perform the duties of station superintendent at £75 per annum, in addition to his existing salary of £200.

Marylebone Electricity Committee recommends that the salary of Mr. E. J. Jennings, secretary and accountant to the electricity department, be increased from £500 to £525 per annum, and afterwards by £25 per annum to £600; also that the salary of Mr. C. H. Smyth, mains engineer, now £500, be advanced on exactly the same scale.

Mr. H. S. Ellis, electrical engineer to the South Shields Corporation, has been invited by the Controller of Coal Mines to act as an honorary representative of the Coal Control Department, and the Corporation has given leave for him to devote part of his time to the work. The district in which Mr. Ellis will work includes the counties of Northumberland and Durham, in which area he will have to interview the Corporation officials, and the engineers of electricity, gas, and water undertakings to discuss questions of coal economies. The installation of electric or gas cooking and heating appliances will also be dealt with, with the object of saving coal.

General.—Mr. T. A. St. Johnston has just resigned his position as assistant electrical engineer at the Associated Equipment Co.'s Works, at Walthamstow, to take up a new appointment as works superintendent with the Micanite and Insulator Co., Ltd., whose works are in the same district. He was presented with a cigarette case from the employés in the electrical department on leaving.

Mr. H. N. Hickley, managing director of Messrs. Newtons, Ltd., electrical engineers, of Taunton, on his marriage to Miss Meade-King, of Walford, has been presented by the employés with a silver kettle with spirit lamp and stand, a silver cigarette box, and an illuminated album.

The marriage has taken place of Mr. G. Berkeley Rolfe, B.Sc., A.M.I.E.E., and Miss Violet McKenzie Scott, of Bedford Park, W.

Mr. Norman Rogers, formerly with the B.T.H. Co., Rugby, has relinquished his appointment in the Industrial Arts Department of the Cincinnati Public Schools in order to prepare for active service with the United States Officers' Reserve.

Roll of Honour.—Captain R. S. Rooney, R.E., who has died of wounds, was an electrical engineer with the British Electric Plant Co., Ltd., Alloa.

Private H. West, Durham L.I., who has died from wounds received in action, was employed at the Bradford Corporation electricity works.

Gunner J. Harrison, Australian F.A., who is in a London hospital wounded, was formerly employed in the Leeds Corporation electricity department.

Sergeant F. C. Luscombe, Seaforth Highlanders, who has died from the effects of gas poisoning, was prior to the war an electrician with Rolls-Royce, Ltd.

Lieutenant Eric Sleight, who has been wounded, and has had his foot amputated, enlisted whilst manager of the tramways at Carlisle.

Lance-Corporal A. Brown, R.E., aged 23, who has been awarded the Military Medal, was employed as an electrician with Messrs. Dick, Kerr & Co., at Preston. He gained the distinction for laying a cable across "No Man's Land" on the day the infantry went over, and under heavy fire.

Bombardier W. D. Thompson, West Lancashire Field Artillery, who has been awarded the Military Medal, was employed by Blackpool, Lytham and St. Annes Tramway Co.

Lance-Corporal H. Parker, South Lancashire Regiment, who has been killed in action, aged 22, was employed at the B.I. & Helsby Cable Works.

Flight Sub-Lieutenant J. D. Grant, R.N., drowned at sea as the result of a seaplane accident, was in the service of the General Electric Co., Ltd., at Manchester.

Captain R. H. Uhthoff, R.E., who was mentioned in this column last week, was the head of the engineering department at one of the works of Messrs. Pilkington Bros., Ltd., not their chief electrical engineer. Mr. P. M. Hogg is the company's chief electrical engineer.

Lieutenant A. J. Adamson, R.G.A., who has been killed in action, was a clerk with the Oxford Electric Light Co., Ltd.

Temporary Lieutenant F. H. Webb, R.F.A., who has been awarded the Military Cross for conspicuous gallantry and devotion to duty, is a son of Mr. S. H. Webb, president of the National Federated Electrical Association, with whom he was associated in his business at Leicester up to his joining the Army in the early days of the war.

Obituary.—Mr. B. G. Arkwright.—The death is announced, at the age of 55, of Mr. Bernard G. Arkwright, a director of Sir W. G. Armstrong, Whitworth & Co., Ltd., who was also manager of the company's engine works.

Will.—The late Mr. F. A. Hopkinson, chairman of Messrs. J. Hopkinson & Co., Ltd., Huddersfield, left £56,101 gross.

NEW COMPANIES REGISTERED.

Corona Lampworks (Ireland), Ltd. (4,498).—Private company. Registered in Dublin, October 3rd. Capital, £6,000 in £1 shares. Manufacturers of and dealers in all kinds of electric bulbs, lamp fittings, &c. Agreement with the Corona Lampworks, Ltd. The subscribers (each with one share) are:—W. Hepworth-Collins, 10, Ascham Street, Kentish Town, London, N.W.; C. Shields, 93, Foulden Road, Stoke Newington, London, N., cashier. The first directors are:—Geo. N. Ogilvie, W. Hepworth-Collins, and C. Shields. Solicitor: Chas. M. Worsley, 2, Walbrook, London. Secretary: C. Shields.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Harold Wood Electrical & Engineering Supplies Co., Ltd.—Memorandum of satisfaction in full on August 31st, 1917, of debentures dated October 17th, 1913, securing £600, has been filed.

Rural Electricity Supply Co., Ltd.—Particulars of £1,700 debentures created August 10th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Suffolk Electricity Supply Co., Ltd.—Particulars of £2,000 debentures created August 22nd, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. The above debentures are in addition to the previous issue not exceeding half the amount of the paid-up capital by consent of the holders of the previous issue.

CITY NOTES.

Marconi Wireless Telegraph Co. of Canada, Ltd.

The report for an 11-month period states that for the third successive season the company has had to contend with the abnormal conditions created by the war, and, despite the difficulties imposed by various restrictions, an increased volume of Transatlantic traffic was handled between the company's Glace Bay station and Great Britain, as was anticipated. This improved volume is since being well maintained. The value of the company's organisation, both to shipowners and to the Naval authorities, has again been demonstrated. The school of instruction conducted by the company has been a

factor in contributing to maintain the company's staff in replacing operators assigned for duty in all parts of the globe. Schools in affiliation with the company are also conducted on the Pacific Coast at Vancouver and Victoria, B.C. The output of the company's plant in Montreal was somewhat less than during the previous year, due to the fact that a smaller number of installations was required for Naval purposes. Advantage was taken of this opportunity to develop an improved type of ship apparatus, combining the best practice in design with reliability of operation in unskilled hands. Compact and self-contained, the new cabinet set, either of medium or large size, can be installed on shipboard in short order, thus meeting the frequent demand under present conditions for emergent installations. This new design has received favourable comment both in Naval and mercantile quarters, and its success has been followed up by the development of a smaller set on similar lines, which should open up a large field for service on cargo and smaller vessels, where the cost of wireless equipment hitherto has been regarded as prohibitive. The company has subsequently been awarded further important orders for the purchase of a considerable number of wireless sets of various types. As a further step in the company's policy for increasing the facilities of its service to shipowners, a divisional office for the Maritime Provinces has been established at Halifax, thus completing the plan of maintaining stores and offices at the important divisional points of Vancouver, Toronto, Montreal, Halifax, and St. John's, Newfoundland. The number of wireless telegraph stations operated by the company on shipboard has shown an increase during the year, notwithstanding the fact that several installations had been lost or transferred to other routes. The same difficult conditions had prevailed with regard to message traffic to and from ships, due not only to general dislocation of sailing schedules, but also to strict censorship and other limitations imposed on commercial messages, nor can any improvement in these adverse conditions be looked for during the period of the war. The directors have not yet been able to obtain from the Government a basis of settlement in respect of remuneration for the use of certain coast stations taken over by the Naval Department since the commencement of the war, or compensation for other services rendered to the Admiralty and elsewhere.—*Financier.*

Escher, Wyss & Co.—The report of Escher, Wyss & Co., of Zurich, which deals with the year ended March 31st, 1917, states that the production in most departments was again approximately on the level of an ordinary peace year. The great difficulties experienced in obtaining raw and other materials, the forwarding of goods, and in connection with the enhanced cost of living for the workmen, considerably increased as compared with the previous year. It was necessary to pay unprecedentedly high prices for some materials, and frequently to pay before delivery. The arrival of orders continued very satisfactory, especially the extensive contracts for hydraulic turbines, whilst a very favourable turnover was also obtained in steam turbines. Special apparatus was made for the native chemical industry, and large orders have recently been received for compressors. After allocating £41,000 to depreciation, as against £32,000 in 1915-16, the accounts exhibit net profits of £20,000, as compared with £17,000, and the dividend is 5 per cent., as contrasted with 4 per cent. in the preceding year.

Companies to be Struck Off the Register.—The following companies will be struck off the register unless cause is shown to the contrary within three months:—

Acton Battery Co., Ltd.
Electrical Sales Promotion, Ltd.
London Battery & Manufacturing Co., Ltd.
Mies' Electrical & Chemical Culture, Ltd.
Photo-Telegraph & Cable Co., Ltd.
Scandinavian Water Power & Paper Mills, Ltd.
Trade Journals, Ltd.
United Cablegram Co. of France, Ltd.
United Kingdom Manufacturers' Representative Association, Ltd.

Shanghai Electric Construction Co., Ltd.—Interim dividend at the rate of 5 per cent. actual (10s. per share), less tax.

Rio de Janeiro Tramway, Light & Power Co., Ltd.—Dividend, 1¼ per cent. on the capital stock.

Sao Paulo Tramway, Light & Power Co., Ltd.—Dividend, 2½ per cent. on the common stock.

Cuba Submarine Telegraph Co., Ltd.—Interim dividend 5 per cent. per annum, free of tax, on ordinary shares.

Oriental Telephone & Electric Co., Ltd.—Interim dividends of 3 per cent. on the 6 per cent. cumulative preference shares for the current year, less income-tax, and 4 per cent. on the ordinary shares, free of income-tax.

Indo-European Telegraph Co., Ltd.—Interim dividend for the half-year ended June 30th last at the rate of 5 per cent. per annum, free of tax.

Direct United States Cable Co., Ltd.—Interim dividend of 2s. per share, less income-tax at 5s. in the £, making with the interim dividend already paid a total distribution of 4 per cent. for the half-year ended September 30th.

Royce, Ltd.—Dividend, 5 per cent; £5,000 is written off goodwill, and £224 is carried forward.

Glenboig Union Fireclay Co., Ltd.—The directors have placed £12,000 to reserve, and out of surplus of £62,000 they recommend an ordinary dividend of 35 per cent., less tax, and carry forward £22,579.

Calcutta Tramways Co., Ltd.—Interim dividend on the ordinary shares at the rate of 2½ per cent., free of tax.

STOCKS AND SHARES.

Tuesday Evening.

The outstanding feature in the markets at the present time is the strength of all the gilt-edged stocks. The rise in the prices of the 5 per cent. War Loan and Consols has stimulated subscriptions to the new War Bonds, applications for which are now flowing in freely. There is no lack of money available for investment. The fine news from the Western Front plays a prominent part in helping prices; and there are few markets in the Stock Exchange which have not responded to the latest advance in Flanders.

To give some idea of the scarcity of good investments which prevails, we may observe that it lay within our province the other day to make some inquiries for what shares were on offer in the list of home electricity companies. The principal dealers in the market ran through the whole catalogue of shares, and out of the list of the best concerns there were scarcely a couple of hundred shares on offer altogether. This is as good an illustration as can be cited of the difficulty which meets the intending investor in such companies. Of course, if he likes to bid fancy prices—that is to say, prices well above the market figures—he might possibly be able to lay in a few hundred pounds' worth of stock. But unless he is prepared to do this, his choice is limited in the extreme. The only change on the week is a rise of ¼ in Westminster ordinary, which has advanced the price to 6¼, so that the yield at the present time is barely 5¼ per cent. on the money.

The Home Railway market is better, reflecting the strength of Consols; and the improvement has been shared by the Undergrounds, as well as by the stocks in the heavier list. The rise in Undergrounds has naturally been the subject of quiet jesting, although it follows events which were very far from humorous. Underground Electric incomes gained a point to 83¾, and the ordinary shares at 1½ are ½ higher. The shares just lately have received some attention from the speculative investor in the country, and the shilling shares at 6s. 3d. are a few pence better on the week. Metropolitans regained the ¼ which they lost the other day, and the various Central London stocks maintain the rises which they recently put on.

Mexican affairs are still rather hopeless, but the latest news is to the effect that there is a chance of a change in the Mexican Ministry, which, if it came about, would make the attitude of Mexico much more definite towards Germany, bringing her conspicuously into line with the Allies. The dramatic rise in the price of silver, the metal, has been followed by a sharp fall. But silver, in spite of the reaction, still commands a big price; and, of course, the value of the white metal makes a considerable difference to Mexican issues of all kinds. Mexican Light and Power preferred has risen to 35, a jump of 3½ points, and Mexico Tramways Firsts are 2 up at 46¼.

No improvement has occurred in the British Columbia group, and Brazilian Tractions continue weak at 46. The Anglo-Argentine Tramways market is very steady, there being noticeable inquiry for the first preference shares. Labour troubles are still agitating the Argentine Republic; and it is only within the past few days that a partial resumption of railway traffic, under the protection of the military, has got under way.

The telegraph list is quiet, with small improvements in Anglo-American Telegraph deferred stock and in West India and Panama shares, the latter recovering the slight decline which occurred last week. Great Northerns are £1 up at 31, but Indo-Europeans at 53½ show a fall of the same amount. There is a good deal of activity in American Marconi shares, and the price has risen to 22s., though the parents keep about 3¾, and Canadians seem unable to get away from the price of 10s. 6d., at which they have stuck for some weeks.

In the manufacturing group, British Insulated have dropped back to 14, but Telegraph Constructions have reached the level 40. Small falls have occurred in British Westinghouse preference and in Babcock & Wilcox shares. The recent animation in Edison Swan has given place to quietude; and although the price of the shares keeps steady about a guinea, speculation has died out for the time being. The fully-paid remain at 35s. Henleys have risen to 15¼.

Business is good amongst rubber shares, where prices are well held, and the reaction in the price of rubber to 2s. 8d. had little effect. Movements, however, are narrow, and of little consequence from day to day. Base-metal shares are generally better, a good dividend from the Rio Tinto Copper Co. putting up the prices in their market, while the conclusion of the strike on the Broken Hill field has brought about improvement in the Barrier shares. There is not much doing amongst armaments, though several of the explosives are again mounting.

Good wishes have poured in upon Mr. H. B. Renwick, the managing director of the County of London Electric Supply Co., upon his recent appointment in the Ministry of Food. Considering the wide experience which Mr. Renwick has had in the way of organisation in business matters, the appointment should prove a valuable one to the country, and everyone will wish him success in his new office.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price Oct. 9, 1917.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	9	6½	—	£6 18 6
Charing Cross Ordinary	5	5	8¼	—	6 0 0
do. do. do. 4½ Pref.	4½	4½	6¾	—	6 13 4
Chelsea	4	3	2¾	—	6 9 1
City of London	8	8	12½	—	6 4 3
do. do. 6 per cent. Pref.	6	6	10½	—	5 18 5
County of London	7	7	11½	—	6 5 10
do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	6	5½	—	5 14 8
London Electric	3	3	1	—	Nil
do. do. 6 per cent. Pref.	6	4	8¾	—	5 6 8
Metropolitan	3	3	3½	—	4 12 4
do. 4½ per cent. Pref.	4½	4½	6¾	—	7 4 8
St. James' and Pall Mall	8	8	7	—	5 14 6
South London	5	5	2¾	—	7 5 6
South Metropolitan Pref.	7	7	21/6	—	5 10 8
Westminster Ordinary	7	7	6½	+ ¼	5 3 8
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	99	—	6 1 0
do. Def.	33/8	1½	23¾	+ ¼	6 9 5
Chile Telephone	3	3	7⅞	—	5 11 4
Cuba Sub. Ord.	5	5	8¾	—	5 14 3
Eastern Extension	8	8	14½	—	*5 8 4
Eastern Tel. Ord.	8	8	148½	—	*5 7 9
Globe Tel. and T. Ord.	7	7	13	—	*5 7 8
do. Pref.	6	6	10¾	—	5 15 8
Great Northern Tel.	22	24	39	+1	6 3 1
Indo-European	12	12	53¼	−1	6 1 6
Marconi	10	15	3¾	—	4 9 0
Oriental Telephone Ord.	10	10	9¼	+ ⅛	2 19 3
United R. Plate Tel.	3	3	6¾	—	*5 16 4
West India and Pan.	6d.	6d.	1⅛	+ ⅛	5 4 1
Western Telegraph	8	8	14½	—	*5 10 4
Home Rails.					
Central London, Ord. Assented	4	4	6¾	—	5 12 8
Metropolitan	1	1	29⅞	+ ½	4 4 3
do. District	Nil	Nil	16¾	—	Nil
Underground Electric Ordinary	Nil	Nil	1⅞	+ ⅛	Nil
do. do. "A"	Nil	Nil	6/3	+8d.	Nil
do. do. Income	6	4	85½	+1	*4 15 10
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	47	—	6 3 1
Anglo-Arg. Trams, First Pref.	5½	5½	3⅞	—	8 14 0
do. 2nd Pref.	5½	—	2½	—	—
do. 5 Deb.	5	5	67½	—	7 8 3
Brazil Tractions	4	4	46	—	—
Bombay Electric Pref.	6	6	96	—	6 4 8
British Columbia Elec. Ry. Pfce.	5	5	40½	—	12 4 10
do. do. Preferred	Nil	Nil	29	—	Nil
do. do. Deferred	Nil	Nil	27½	—	Nil
do. do. Deb.	4½	4½	50	—	8 10 0
Mexico Trams 5 per cent. Bonds	Nil	Nil	46½	+2	Nil
do. 6 per cent. Bonds	Nil	Nil	40	—	Nil
Mexican Light Common	Nil	Nil	22½	—	Nil
do. Pref.	Nil	Nil	35	+3½	Nil
do. 1st Bonds	Nil	Nil	45½	−1	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	3⅞	— ¼	4 14 4
British Aluminium Ord.	7	10	1¾	—	6 3 1
British Insulated Ord.	17½	20	14¾	— ¼	7 2 10
British Westinghouse Pref.	7½	7½	2⅛	— ⅛	4 18 0
Callenders	20	20	144	—	6 19 0
do. 5 Pref.	5	5	4½	—	5 1 4
Castner-Kellner	22	22	5⅞	—	5 8 0
Edison Swan, fully paid	—	—	1¾	—	Nil
do. do. 4 per cent. Deb.	4	4	72½	—	5 10 4
Electric Construction	7½	7½	1	—	7 10 0
Gen. Elec. Pref.	6	6	10⅜	—	5 15 8
do. Ord.	10	10	17½	—	5 14 3
Henley	25	25	15⅜	+ ½	7 18 8
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	13⅜	—	*7 5 6
Telegraph Con.	20	20	40	+1	*5 9 6

* Dividends paid free of income-tax.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month. £	Receipts for the month. £	No. of weeks.	Total to date. £	Total to date. £	Route miles open.	Inc.
Bristol (Trams)	Sept. 28	21,804	+3,446	39	192,936	+16,942	30·5	..
Cork	„ 27	2,262	+ 147	39	21,863	+ 1,977	9·89	..
Dublin	„ 28	25,0 8	+2,575	39	260,814	+25,529	54·25	..
Hastings	„ 30	6,985	+1,053	39	49,702	+ 7,887	19·3	..
Lancashire United	„ 26	11,058	+2,746	41	90,910	+20,076	42	..
Llandudno-Col. Bay	„ 21	2,232	— 157	42½	15.153	— 961	6·5	..
Anglo-Argentine	„ 30	218,992	+8,048	39	2,002,670	+24,227	..	..
Auckland	„ 21	23,154	+1,270	12	64,876	+ 2,018	26·20	·54
Calcutta	Aug. 29	19,114	+ 204	..	..	+ 1,491	..	..
Kalgoorlie, W.A.	June	2,648	..	26	15,441	..	20.5	..
Madras	Sept. 30	4,595	+ 272	39	41,629	+ 2,691	..	..
Montevideo	Sept.	29,436	+2,715	48	329,679	+10,636	..	..

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, October 10th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£76	..
a Ammonia, Muriate (large crystal)	„	£54	..
a Bisulphide of Carbon	„	£28	..
a Borax	„	£39	..
a Copper Sulphate	„	£61	..
a Potash, Chlorate	per lb.	2/6	..
a „ Perchlorate	„	2/-	..
a Shellac	per cwt.	£12 10	..
a Sulphate of Magnesia	per ton	£16	..
a Sulphur, Sublimed Flowers	„	£35	..
a „ Lump	„	£34	..
a Soda, Chlorate	per lb.	19½d.	..
a „ Crystals	per ton	12/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 3' to 12' basis)	per lb.	..	..
c „ Tubes (solid drawn)	„	..	..
c „ Wire, basis	„	..	..
c Copper Tubes (solid drawn)	„	1/6½ to 1/7	½d. dec.
g „ Bars (best selected)	per ton	£151	£4 dec.
g „ Sheet	„	£151	£4 dec.
g „ Rod	„	£151	£4 dec.
d „ (Electrolytic) Bars	„	£125	£5 dec.
d „ „ Sheets	„	£153	£5 dec.
d „ „ Wire Rods	„	£133	£5 dec.
d „ „ H.C. Wire	per lb.	1/6½	⅛d. dec.
f Ebonite Rod	„	8/-	..
f „ Sheet	„	9/6	..
n German Silver Wire	„	2/3	..
h Gutta-percha, fine	„	6/10	..
h India-rubber, Para fine	„	4/5	2½d. inc.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l „ Wire, galv. No. 8, P.O. qual.	„	£42	..
g Lead, English Pig	„	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 8/-	..
e „ „ „ medium	„	3/6 to 6/-	..
e „ „ „ large	„	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/8½	½d. dec.
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	„	..	..
n „ Wire, Nos. 1 to 16	per lb.	3/6	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Science and Industry in South Africa.—In his presidential address to the S.A. Association for the Advancement of Science, reported in *Nature*, Prof. John Orr stated that the Government had not always fully realised in the past the powerful aid of science and scientific research in general and industrial development, and had paid totally inadequate salaries to the *personnel* of its scientific departments. But all this was going to be changed; science had gained immensely in prestige since the war began, and perhaps the greatest lesson of the war had been the realisation of the necessity for more scientific methods in relation to industry. They must realise that the whole fabric of industry was based on science, and Governments were now recognising it as their duty to promote scientific research on a national scale.

The land abounded with examples of neglected opportunities. The absence of a "primary" iron and steel industry in South Africa was most keenly felt; they had the raw materials in coal and ore. A successful experimental plant, constituting the first electric furnace in South Africa, was erected by the Chamber of Mines during the past year for making steel castings (shoes and dies) from scrap metal, and the manufacture of bar iron, &c., from scrap metal had been carried on for some years in the Transvaal. Such industries had been referred to as "bastard" industries; primary industries utilising the raw materials were essential. A start was made in June in electrochemical industries, when a factory for the manufacture of carbide was inaugurated on the Rand; but electrochemical industries in other parts of the world relied mainly upon cheap electricity derived from water-power, and it was of the utmost importance in the industrial development of the country that the Government should spare no expense in having the water-power resources of South Africa immediately investigated.

Portable Electric Lighting Plants.—It is stated that in both the French and Italian armies portable electric lighting plants are being largely made use of for the illumination of officers' quarters. The sets consist of a water-cooled petrol engine, direct-coupled to a generator, both being mounted on a wooden platform capable of being carried by a couple of soldiers. Wiring and lamp sockets are packed separately, and are in charge of an electrician. The entire outfit is brought up on a motor wagon, and, with the aid of three or four men, staff quarters can be fitted up with an electric lighting installation in about an hour's time.

1916.—Union of South Africa: Various Public Supply Electrical Undertakings. Compiled by E. Poole, A.M.I.E.E., Durban. [COPYRIGHT.]
Municipal Bulk Supply. LIGHT AND POWER.
Vol. Purchase Revenue Capital Plant

1916.—Union of South Africa: Various Public Supply Electrical Undertakings.

LIGHT AND POWER.

Compiled by E. Poole, A.M.I.E.E., Durban. [COPYRIGHT.]

Municipal Bulk Supply.

Town.	Population. W=white. C=coloured.	Date of start.	Manager.	Bulk supply from or owners.	Distribution system. v=volts; c=cycles; w=wires.	Units sold.	Plant or s/s. cap. KW.	Capital expenditure. £	No. of consumers. Light.	No. of consumers. Power.	Street lamps. No.	Street lamps. c.p.	Revenue last year. £	Tariff of charges. L=light; P=power.	Purchase price of energy. Pence.	Remarks.
Boksburg ..	W 11,582 C 22,077	1906	F. R. Clark (Town Engineer)	Victoria Falls Co.	A.C. 230 v, 50 c, 3 w	546,000	400	24,826	1,000	20	600	50	3,901	6d. L, 1½d. P	1½	Tramways also.
Benoni	W 15,000 C 55,000	1912	P. J. Gold	Kleinfontein Co.	A.C. 3-phase, 25 c, 4 w, 200 v. light, 346 v. power	473,000	520	19,680	1,510	29	270	50	12,300	7d. to 4d. L, 2½d. P	2½ L, 1½ P	Motor-'buses also.
Germiston ..	W 15,317 C 38,244	—	—	Victoria Falls Co.	A.C. 3-phase, 50 c, 3 w 120 v light, 200 v power	—	—	—	—	—	—	—	—	5d. L, 4d. P, 1½d. cooking	—	Tramways also.
Kimberley ..	W 18,000 C 35,500	1904	R. W. H. Smith	De Beers Co.	A.C. 50 c, 220 v, 2 & 3 w	830,217	1,260	38,994	1,229	138	35 191	Incdts. Enc. arcs.	11,377	6d. L, 2½d. P	2	Supply Co. controls distribution.
Roodepoort ..	W 7,192 C 25,550	1912	R. Hortimer	Victoria Falls Co.	A.C. 3-phase, 50 c, 3 & 4 w, 230 v light, 400 v power	225,984	225	14,015	750	4	248	50	5,540	8d. to 6d. L, 4½d. P	2½	—
Standerton ..	W 1,740 C 1,559	1908	W. Leonard	S.A. Railway.	D.C. 230 v, 2 w	36,661	75	3,825	165	—	150	—	2,080	9d. less 10 per cent. over 300 units	4½	—
Springs	W 2,000 C 7,000	1912	C. M. McComb (Town Engineer)	Victoria Falls Co.	A.C. 200 v, 50 c, 3 w	82,677	200	5,500	242	6	114	Series lamps	1,894	7d. L, 2d. to 4d. P, 4d. cooking	1·63	Portion of area 3 p, 3 w.

Private Company Supply.

Town.	Population. W=white. C=coloured.	Date of start.	Manager.	Bulk supply from or owners.	Distribution system. v=volts; c=cycles; w=wires.	Units sold.	Plant or s/s. cap. KW.	Capital expenditure. £	No. of consumers. Light.	No. of consumers. Power.	Street lamps. No.	Street lamps. c.p.	Revenue last year. £	Tariff of charges. L=light; P=power.	Purchase price of energy. Pence.	Remarks.
Dundee	W 1,140 C 1,862	1902	E. H. Gellender	E. H. Gellender and Co.	D.C. 220 v, 3 w (2/250 v lamps in series)	—	175	15,000	220	4	85	—	—	8d., 4d., 3d., and 2d.	—	Steam plant.
Indwe	W 600 C 500	1908	G. Muller	Indwe Coal Co.	D.C. 500 v, 2 w	80,500	300	—	60	2	66	16	597	6d. L, 2d. and 3d. P	—	In liquidation.
Volksrust ..	W 1,026 C 891	1912	G. Strong	E. H. Gellender and Co.	D.C. 220/440 v, 3 w	—	100	8,500	150	—	126	—	—	11d. L, 4d. and 3d. P	—	Steam plant.
Vryheid	W 1,150 C 1,100	1908	B. Sargent	I.H. & G.P. Co., Ltd.	D.C. 200 v, 2 w	21,560	27	3,500	140	1	60	—	1,078	12d. L and P	—	Suction gas plant.

TRAMWAYS.

Municipal Supply.

Town.	Date of start.	Manager.	System: D.C.	Miles track. Single.	Miles track. Double.	No. and type passenger cars.	Other rolling stock.	Capital expenditure. £	Units used.	Price per unit.	Car-miles.	Passengers carried.	Total revenue. £	Operating expenses per car-mile.	Remarks.
Bloemfontein ..	1915	G. A. Stewart (City Engineer)	Span wire and bracket construction. 550/500. *Trackless.*	—	—	10 "R.E.T."	—	44,227	192,381	1d.	189,864	994,177	7,834	11·64d.	Year ending March, 1917.
Durban	1902	H. N. Thomas	Centre, side, and span construction. 550/500. Trolley.	9·25	11·15	90 d/d 4-wheel, 1 d/d 8-wheel	1 funeral car, 3 sprinklers, 12 freight-cars	591,714	3,701,851	1d.	1,736,097	17,589,375	145,365	12·41d.	Purchased from Durban T. Co. for £114,350.
East London ..	1899	J. M. Lambe	Centre and span construction. 550/500. Trolley.	2	2	15	—	57,343	441,365	1·5d.	250,936	3,022,870	17,028	15·84d.	—
Johannesburg ..	1906	J. H. Dobson	Centre, side, and span construction. 550/600. Trolley.	(track) 65·154		5 motor road 'buses, 114 d/d 4-wheel, 28 d/d 8-wheel	8 freight, 5 water, 2 motor tower wagons (elec. and petrol) 1 water.	880,456	7,855,151	1·879d.	3,377,014	(1915) 30,925,558	382,221	18·04d.	Purchased from Johannesburg T. Co. in 1904.
Pietermaritzburg	1904	P. Finlayson	Centre and side construction. 500 v. Trolley.	6	2·25	1 Tilling-Stevens 'bus, d/d Brush, 6 bogie, 4 radial, 6 ordinary		113,786	243,542	1·5d.	245,700	2,152,781	11,712	10·25d.	—
Pretoria	1910	T. Wolley-Dod	Centre pole construction. 500 v. Trolley.	3·67	6	3 motor 'buses, 25 s/d, 4 and 8 wheel	3 freight, 2 water.	242,179	1,022,000	1·5d.	563,720	—	48,095	14·24d.	Purchased from Pretoria T. Co. for £40,000.

Municipal Bulk Supply.

Town.	Date of start.	Manager.	System: D.C.	Miles track. Single.	Miles track. Double.	No. and type passenger cars.	Other rolling stock.	Capital expenditure. £	Units used.	Price per unit.	Car-miles.	Passengers carried.	Total revenue. £	Operating expenses per car-mile.	Remarks.
Boksburg ..	1914	F. R. Clark	Mostly span construction. 500 v. *Trackless.*	route. 5·25		6 "R.E.T." (28 passengers)	—	23,000	154,000	1·93d.	110,000	630,000	7,991	19·04d.	—
Germiston ..	1914	—	Side-pole construction. 500 v. *Trackless.*	9·5		10 Cedes Stoll	—	55,000	222,700	Av. 1d.	192,707	—	7,329	13·66d.	—

Private Company Supply.

Town.	Date of start.	Manager.	System: D.C.	Miles track. Single.	Miles track. Double.	No. and type passenger cars.	Other rolling stock.	Capital expenditure. £	Units used.	Price per unit.	Car-miles.	Passengers carried.	Total revenue. £	Operating expenses per car-mile.	Remarks.
Cape Town ..	1896	W. F. Long ..	Span wire and side construction. 550 v. trolley	16·05	5·86	62 d/d., 15 s/d.	2 freight, 3 water, 1 tower wagon	—	4,302,874	—	1,993,393 (Camps Bay cars) 81,888	16,434,842	172,168	11·93d.	Owned by City, Cape Town, and Green Point T. Co., Ltd.
Camps Bay ..	1901	W. F. Long ..	Span wire and side construction. 550 v. trolley	6·87	—	7 open, 7 composite	3 freight	250,933 including generating plant	598,806	2·02d.	213,675	707,875	17,487	17·24d.	Owned by Camps Bay T. Co., Ltd.
Kimberley ..	1905	—	Span wire and side construction. 500 v. trolley	(Track) 16		20 open	1 freight, 1 water	—	—	—	611,229	2,089,863	—	—	Owned by De Beers Co., Ltd.
Port Elizabeth..	1897	W. H. Freemantle	Side and span construction. 550 v. trolley	3·42	5·61	13 d/d., 21 s/d.	1 trailer, 1 water, 1 prison van.	175,000	1,046,410	1·206d.	550,000	4,042,524	40,600	11·23d.	Owned by Port Elizabeth T. Co., Ltd.

1916.—Union of South Africa: Municipal Electrical Undertakings.

COMPLETE PLANTS: LIGHT AND POWER.

General Table.

Compiled by E. POOLE, A.M.I.E.E., Durban. [COPYRIGHT.]

Town.	Population. W=white. C=col'red.	Date of start.	Manager.	Source of power. C.=condensing. N.C.=non-condensing.	Generation system. v=volts; c=cycles; p=phase.	Distribution system. O.H.M.=overhead mains. U.G.M.=underground mains. v=volts; c=cycles; w=wires.	Units sold.	Max. load. KW.	Plant capa'ty. KW.	Load factor (year).	Capital expenditure. £	Cost per KW. installed. £	No. of consumers. Light.	No. of consumers. Pow.	Street lamps. No. and C.P.	Remarks.
Aliwal North ..	W 2,400 C 5,060	1905	E. Taylor	Water and oil	D.C. 500 v	D.C. 3 w, 230/460 v, U.G.M. only	63,556	—	170	—	752,000	306	226	5	87 (50 and 100)	Expenditure includes water scheme.
Bloemfontein ..	W 13,800 C 14,500	1900	G. A. Stewart (City Engineer)	Steam C	A.C. 2-phase, 2,100 v, 50 c	D.C. 500 v, A.C. 200 v & 347 v, 3 & 4 w, U.G. and O.H.M.	2,019,653 (to Mar., '17)	860	1,650	26·8	184,252	112	1,840		600(?) (50 & 2,000)	Tramways also.
Bethlehem ..	W 1,850 C 1,350	1905	M. McDonough (Town Engineer)	Gas	D.C. 500 v	D.C. 480/240 v, 3 w, O.H.M.	—	—	125	—	—	—	130		— —	Year 1915.
Cape Town and suburbs	W 85,156 C 78,668	1895	G. H. Swingler (Acting)	Steam C	D.C. 440 v, A.C. 2-phase, 2,200 v, 50 c	D.C. and A.C. various v, 2, 3, 4 & 5 w, U.G. & O.H.M.	13,424,594	4,545	8,900	33·8	665,000 (1915)	74	7,586		2,500 (50 to 1,500)	Purchased from C. P. Co. in 1912; supplying Sea Point, Kalk Bay, Maitland, Woodstock, Mowbray, Claremont, Rondebosch, and Wynburg (semi-bulk).
Ceres	W 946 C 1,649	1910	P. J. C. Spies	Water	D.C. 145 v	D.C. 145 v to 110 v, 2 wire, O.H.M.	est. 9,000	23	23	4·4	2,900	126	78	—	76 25	
Cradock	W 3,000 C 3,400	1914	H. Brittle	Oil	D.C. 450 v	D.C. 220/440 v, 3 wire, O.H.M.	39,800	44	100	10·3	10,326	—	340	5	107 (60 and 100)	
Durban	W 35,848 C 38,312	1897	J. Roberts	Steam C	D.C. 550 v, A.C. 3-phase, 6,600 v, 50 c, 1-phase, 2,750 v, 62 c	D.C. 550/500 v, A.C. 3-phase, 6,600 v and 500 v, 1-phase, 100, 200 & 400 v, 2 & 3 wire, O.H. & U.G.M.	20,025,906	5,099	10,000	44·8 (70 max.)	550,172	55	7,536	881	2,258 (32), 307 (400), 19 (600), 26 (100)	Tramways also.
Ermelo	W 2,400 C 1,063	1914	A. Douglas	Steam N.C	D.C. 500 v.	D.C. 250/500 v, 3 wire, O.H.M.	47,846	—	50	—	8,711	174	180	3	64 (100, 200 and 400)	
East London ..	W 14,000 C 7,000	1899	J. M. Lambe	Steam C.	D.C. 550 v, A.C. 1-phase, 2,200 v, 50 c	D.C. 550/500 v A.C. 110 v, 2 w, U.G. and O.H.M.	1,474,736	1,010	988	16·7 (29 max.)	59,818	60	1,711	89	571 —	Tramways also.
Greytown ..	W 1,310 C 1,250	1904	W. H. Blatchford	Steam N.C	D.C. 220 v	D.C. 200 v, 2 w, O.H.M.	55,660	44	74	14·4 (25 max.)	6,539	88	172	6	85 50 3 400	Purchased from Collins and Kessler, in 1904, for £2,050.
Heilbron	2,000	1904	—	Steam N.C and gas	D.C. 250 v	D.C. 230 v, 2 w, O.H.M.	44,100	—	65	—	6,236	96	121		44 —	Year 1915.
Heidelburg ..	W 1,527 C 1,076	1915	T. H. A. Brown	Gas	D.C. 480 v	D.C. 440/220 v, 3 w, O.H.M.	25,401	45	45	6·4	8,071	179	152	1	92 (60 and 80)	
Harrismith ..	W 2,145 C 3,352	1904	T. Millar	Steam	A.C. 1-phase, 2,000 v, 50 c	A.C. 200 v, 3 w, U.G.M. only	115,628	60	185	22	21,000	113	313	6	162 (100, 50 and 32)	
Johannesburg ..	W 134,000 C 119,274	1891	J. H. Dobson	Steam C.	D.C. 600 v A.C. 2-phase, 3,300 v, 50 c	D.C. (inner area) 460/230 v 3 w, U.G. A.C. (outer area) 400/200 v, 1-p &O.H.M.	25,057,534	11,043	13,780	25·9	1,101,294	80	16,091		6,681 (50), 1,300 (100), 278 (16), 38 (1,000 and 2,000)	Purchased from Johannesburg Lighting Co. in 1895 for £165,000. Tramways also.
Krugersdorp and Randfontein	W 13,114 C 41,145	1908 1912	R. W. Fletcher	Steam C. Steam N.C	D.C. 480 v	D.C. 230/460 v, 3 w, O.H. and U.G.M.	752,878 82,802	500 50	700 120	17·2 18·3	48,476 10,951	63 86	1,111 177	59 6	222 60 75 60	Two stations in Krugersdorp Municipality.
King Williams Town	W 5,571 C 3,459	1908	J. Vowle	Steam C.	A.C. 1-phase, 2,200 v, 50 c	A.C. 220 v, 2 w, U.G. and O.H.M.	297,309	128	200	21·6	27,690	139	755	30	200 50	Purchased from King Elec. Light Co. in 1905 for £23,251.
Kroonstad ..	W 2,782 C 3,071	1904	R. A. Stoker (Town Engineer)	Steam N.C	D.C. 250 v	D.C. 230 v, 2 w, U.G. and O.H.M. (Pumping at 460 v)	516,276	153	180	38·5 (63·5 max)	12,500	69	411	17	143 (50 and 100)	
Klerksdorp ..	W 2,208 C 2,087	1911	J. R. English	Gas	D.C. 480 v	D.C. 230/460 v, 3 w, O.H.M.	118,000	75	70	17·9	10,525	150	240	3	120 100	
Ladysmith ..	W 2,283 C 2,712	1908	T. Jagger	Steam N.C	D.C. 220/440 v	D.C. 220/440 v, 3 w, O.H.M.	360,567	156	475	26·4	23,097	48	356	9	212 60	
Newcastle ..	W 1,800 C 1,700	1902	G. N. Dawson	Steam N.C	D.C. 250/500 v	D.C. 230/460 v, 3 w, O.H.M.	59,169	—	155	—	8,677	55	230	2	Approx. 300 (32 and 100)	Purchased from Gellender and Co. in 1912 for £6,250. No day supply.
	(1) (2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)		(15)	(16)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)		(15)	(16)
Oudtshoorn ..	W 5,849	1911	F. Castle	Oil	D.C. 440 v	D.C. 220/440 v, 3 w, U.G. and O.H.M.	188,603	135	818	11·8	41,000	184	328	14	200	—
	C 5,851															
Port Elizabeth..	W 19,924	1906	B. Sankey	Steam C	D.C. 550 v	D.C. 250/500 v, U.G. & O.H.M., 2 & 3 w	2,985,706	980	8,500	25·4	197,198	56	2,422	164	10 dame arcs; 44 1-watt, 1,000; 184 1-watt, 100-600; 11 in., 50	Purchased from Oudtshoorn E.L. & P. Co. in 1911 for £88,000.
	C 12,238				A.C. 3-phase, 6,600 v, 50 c	A.C. 1-phase, 250 v, 3-phase, 6,600 and 500 v										
Potchefstroom ..	W 8,102	1912	W. D. Ross	Steam C	D.C. 220/500 v,	D.C. 240/480 v, 3 w, O.H.M.	197,611	155	190	19·5	90,000	108	440		180(f) (100 & 50)	
	C 4,355															
Pietermaritzburg	W 16,500	1896	A. S. Munro	Steam C	D.C. 500 v	D.C. 550/600 v	2,103,977	730	2,300	28·3 (61·5 max)	315,469	68	1,979	77	128 100—300	Tramways also.
	C 16,000				A.C. 3-phase, 2,300 v, 60 c	A.C. 3-phase, 2,300 v 1-phase, 200 v, 3 w, U.G. and O.H.M.									418 50	
Pretoria	W 29,440	1892	T. C. Walley-Dod	Steam C	D.C. 550 v	D.C. 250/500 v, 3 w, U.G. and O.H.M.	4,976,899	2,400	8,000	29·1	217,745	68	4,109	155	1,678 (60, 144 (100), 39 (200—1,000), 60 (100 and 60)	Purchased from Pretoria E.L. Co. in 1904 for £115,000. Tramways also.
Paarl	W 2,000	1913	W. McKenzie	Water	D.C. 460 v	D.C. 220/460 v, 3 w, O.H.M.	35,911	—	80	—	5,500	168	170		260 (50 and 400)	Plant not completed.
	C 600															
Paarl	W 4,895	1917	H. Wragg	Water	A.C. 3-phase, 3,300 v, 50 c	A.C. 220/380 v, 4 w, U.G. and O.H.M.	—	—	150	—	—	—	205 applications		260 (50 and 400)	
	C 6,194															
Queenstown ..	W 2,775	1912	W. Bellad-Ellis	Oil	D.C. 460 v,	D.C. 220/440 v, 3 w, U.G. and O.H.M.	159,000	140	300	12·4 (25 max.)	18,000	90	760	32	178 45	
	C 5,395												100		100	
Somerset, E. ..	W 1,700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	C 3,311															
Smekal	W 600	1915	R. Rascher (Town Engineer)	Gas	D.C. 500 v	D.C. 220/460 v, 3 w, O.H.M.	28,400 (16 months)	30	45	10·8	5,125	133	90	4	43	50
	C 1,700															
Stellenbosch ..	W 2,700	1914	E. J. Hamlin (Town Engineer)	Oil	D.C. 460 v	D.C. 220/440 v, 3 w, U.G. and O.H.M.	78,649	68	80	10·9	11,924	144	328	21	167 (50 and 100)	
	C 2,455															
Ulundage	W 5,294	1911	—	Oil	D.C. 440 v	D.C. 220/440 v, 3 w, O.H.M.	—	—	270	—	20,259	113	180		256 —	Year 1915.
	C 5,849															
Winburg	W 1,018	—	W. H. Hodge (Town Engineer)	Gas	D.C. 240 v	D.C. 220 v, 3 w, O.H.M.	32,997	35	36	15	4,081	113	121	1	88 88	
	C 1,540															
Wellington ..	W 2,420	1914	E. G. Mould	Gas	D.C. 440 v	D.C. 220/440, 3 w, O.H.M.	98,000 (generated)	—	90	—	11,906	117	256	6	120 60	
	C 2,578															
Worcester ..	W 4,000	1916	C. Duncan (Acting)	Water and oil	D.C. 440/600 v	D.C. 220/440, 3 w, O.H.M.	61,919	64	127	11·0	14,005	110	1 251	32	240 (600 and 180	
	C 4,500															

UNION OF SOUTH AFRICA MUNICIPAL ELECTRICAL UNDERTAKINGS.

By E. POOLE, A.M.I.E.E., Assistant Borough Electrical Engineer, Durban.

(*Abstract of paper read before the Engineering Section of the* Natal Society for the Advancement of Science and Art, *at Durban, on August 28th*, 1917.)

(*Concluded from page* 321.)

Tramways.—Private companies were first in the field in nearly all the towns in South Africa with both horse and electric tramways, and even to-day the electric tramways at Cape Town, Camps Bay, Port Elizabeth, and Kimberley are in the hands of such. Other towns have acquired companies' undertakings operated by horses, which have been electrified by power obtained from the lighting station. Bokaburg and Germiston, however, purchase their current for tramways as they also do for lighting, and have adopted the railless system, as has also Bloemfontein, the system adopted by all the other towns being the overhead trolley. Motor vehicles serve as feeders to the main tramway routes at Johannesburg, Pretoria, and Pietermaritzburg, while in the case of Benoni the municipality has lately inaugurated a system of electric 'buses, five in number. Durban has a parcels collection and delivery system, which alone brought in a revenue of £790 last year. A universal gauge of 4 ft. 8½ in. is adopted for the track. The steepest grade and sharpest curve are at Cape Town, being 1 in 8 and 28 ft. radius respectively, while in miles of track Johannesburg has just over 65 miles, or 42 route miles.

In charges for current for tramways, Durban and Bloemfontein are the only two instances where one penny per unit is charged. In road maintenance, some towns charge the tramway department half cost, while others pay in full. A wayleave is charged in the case of Camps Bay Tramway Co. of £50 per mile.

In fares, the penny cash fare does not yet apply to all towns. Pietermaritzburg, Cape Town, Bloemfontein, and East London, however, have adopted it.

Street Lighting.—Many changes have taken place in street lighting in the last few years, and whereas at one time all large towns used arc lamps for their principal thoroughfares, the introduction of the high-candle-power metal-filament and half-watt lamp has practically forced the arc lamp on the scrap heap.

The location of lamps is a point which requires careful consideration; and in my opinion centre lighting from span wires is difficult to improve on. Some few towns are even now adopting this style of construction, which permits of the pavements under the verandahs being lighted as well as the roads, and where trees line the footpaths, as they so frequently do in South Africa, there is far less obstruction to the light than there is with side poles.

The switching of street lamps is in many cases carried out by time switches, though one or two towns have distant solenoid control.

The maintenance of street lighting is an important matter as well as costly, but thanks to the introduction of the modern vehicle (which rightly is an electric one), Durban, by way of example, is able to carry out all its repairs and replacements (and there are over 2,500 lamps to look after) with one man and two natives, whereas at one time it required three men, six Indians, and four natives.

House Services, &c.—Connections to houses are made by overhead as well as underground mains, and in the case of the former the class of wire used, though not highly insulated, offers some sort of protection to those who might come in contact with it. It is a double or triple-braided wire, sometimes compounded, and withstands the weather conditions very well. The application fee covers the cost of the service up to a certain distance, beyond which charges are made, in some cases half the cost, and in others the full cost of the extra material required.

There is a vast variety of meters in use. There are few towns which do not charge meter rent, varying from 6d. to 2s. 6d. per month, which, in the case of Pietermaritzburg, brought in a revenue of over £1,000 last year.

Generally the wiring rules are all based on the Rules of the Institution of Electrical Engineers and Fire Office Rules, though several towns publish their own, which embody special rules to suit the local conditions. Some will not allow casing or bobbin work, one other prefers it, some again carry out consumers' wiring; the majority are against municipal trading in this line, but roughly 50 per cent. of them have adopted assisted wiring, while a few hire out apparatus.

We find all sorts of tariffs from as low as .375d. for a restricted-hour supply at Durban to as high as 1s. per unit at several of the smaller towns, and by going beyond the Union we find a charge of from 1s. 6d. to 2s. at Bulawayo. Durban is cheapest all round, the lighting rate having been lowered to 5d. per unit since August, 1917.

The total European staff of all our municipal stations is about 800 in number, exclusive of tramway staffs.

Finance.—In practically every town the control is vested in the hands of the financial head of the Corporation—the

town treasurer. In favour of this system may be held the fact that the town treasurer is a specialist on finance, but against it is often held out the loss of expediency and economy caused by the unnecessary duplication.

With the recently introduced Government audit, as well as the inter-municipal audit, I fail to see why a proper control could not be kept if the electrical engineer did the accountancy, and there would be no continual overlapping as is now the case. Before, however, such a state of affairs can come about it is necessary to have some universal form for financial statements, as is the case at home.

Though the electrical engineer is generally in control of his own stores, in the few larger towns the control is in the hands of the general storekeeper, who when he buys has to consult the electrical engineer as to details, and when the goods arrive has again to consult the electrical engineer as to whether the goods are up to sample.

On account of the various ways of costing adopted, it is practically an impossibility to make comparisons of working costs with any degree of accuracy.

In regard to the disposal of net profits, most of the larger towns appropriate a large portion to the relief of rates under a providing Act, the amounts set aside last year in the various towns being as follows:—

	Light.	Tramways.
Johannesburg	£49,003	£59,281
Durban	17,936	19,159
East London	1,500	—
Pretoria (1915)	10,000	—

The total amount that has been set aside in Durban since the inauguration of the electric light amounts to no less than £198,527. Other appropriations are in the use of net profits for capital expenditure, special sinking funds or reserve accounts.

The paper is accompanied by the tables printed on pp. 357-359.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

NEW ZEALAND.—Lamps, of patterns approved by the Minister of Trade and Customs, including "Incandescent Mazda" and "New Miniature" electric lamps, specially fitted and peculiarly adapted for microscope work, are now admitted free of duty into the Dominion in accordance with a revised decision by the Customs Department. [A "primage duty" of 1 per cent. *ad valorem* is payable on importation in accordance with the Finance Act of 1915.]

SOUTH AFRICA.—Among recent decisions issued by the Commissioner of Customs as to the classification of various articles under the Customs Tariff, the following are noted:—

	Rate of Import duty.	Rebate on goods manufactured in the U.K. and reciprocating British Colonies.
Insulating tape (sleeving) when imported by importers of electrical material, and on a declaration that it is to be used for insulating purposes ...	3 p.c. *ad val.*	Whole duty.
Patent quazare electrodes ...	3 p.c. *ad val.*	Whole duty.

SOUTHERN RHODESIA.—A Customs decision has been issued recently classifying parts of electric starters for motor cars for Customs duty, as follows:—

Chains are dutiable under Tariff heading 54c at the rate of 20 per cent. *ad val.* under the General Tariff, and at 17 per cent. *ad val.* under the Preferential Tariff on British goods.

Adjusters and parts are dutiable under 114*b* at the rate of 3 per cent. *ad val.* under the General Tariff, British goods being admitted free of duty.

TERRITORY KNOWN AS GERMAN EAST AFRICA.—Regulations have been made by the Senior Customs Officer at Nairobi setting out the conditions under which goods may be conveyed through the occupied territory of "German East Africa" to a foreign port. The text of these regulations, which are at some length, was given in the official *Board of Trade Journal* for July 26th.

CEYLON.—The Customs Tariff has been revised by an Ordinance, dated June 8th, which provides a new schedule of import duties. The general rate of duty leviable upon goods unspecified in the schedule has been increased from 5½ per cent. *ad val.* to 7½ per cent. *ad val.* Among the list of goods specified is copper—blocks, bars, plates, rods, wire, tubes, sheets, ingots, and scraps, on which the duty is Rs. 3 per cwt. The table of exemptions from import duty includes electrical machinery (and component parts) for electric traction and electric lighting, or for certain specified industries; electric accumulators; and lead, pig, and sheet.

BRITISH HONDURAS.—An Ordinance promulgated on June 23rd provides that the export duty on chicle be increased from ¼ cent (½d.) per lb. to 1½ cents (¾d.) per lb. as from June 20th.

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

13,692. "Self-locking electric lampholder or attachment." L. Baggulet and C. W. Lacey. September 24th.
13,697. "Electrically producing a gas for use in internal-combustion engines, &c." T. McClelland. September 24th.
13,699. "Operating and carrying electric flashlamps on or about the person." E. Nuttall. September 24th.
13,713. "Contact rings for dynamos and electric motors." Compagnie Universel Electric (Koulland Frères et Cie). September 24th. (France, October 11th, 1916.)
13,725. "Electrical systems of power transmission and regenerative braking." British Thomson-Houston Co. (General Electric Co., U.S.A.) September 24th.
13,726. "Supporting device for overhead electric trolley wires." P. Dawson, F. W. Fawdry & H. W. H. Richards. September 24th.
13,728. "Cooling electric apparatus." R. Czepek & R. Doczekal. September 24th.
13,737. "Self-exciting dynamo-electric machines." N. Bigg & A. Schaanning. September 24th.
13,738. "Electrically-heated gloves, caps, socks, boots, clothing, carpets, &c." A. A. Lemercier. September 24th. (France, October 26th, 1916.)
13,741. "Electrical transmission arrangements for motor vehicles, &c." J. & J. Sankey & Sons and W. A. Stevens. September 24th.
13,746. "Ignition devices for internal-combustion engines." W. G. Ikin. September 24th.
13,772. "Self-exciting dynamo-electric machines." N. Bigg. September 24th.
13,780. "Electrically reducing refractory substances." J. G. Webb. September 25th. (U.S.A., March 16th.)
13,786. "Separators for storage-battery plates." W. Morrison. September 25th. (U.S.A., April 2nd.)
13,788. "Sparking plug for internal-combustion engines." M. Ferraris. September 25th.
13,796. "Electric lifts." C. M. Lewin. September 25th.
13,848. "Electrical system for indicating alarm of fire, &c., simultaneously at number of stations." A. W. Brown. September 26th.
13,853. "Accumulators or secondary batteries." F. la Roche. September 26th.
13,857. "Connections for electric furnaces." C. Bingham. September 26th.
13,858. "Electric furnaces." C. Bingham. September 26th.
13,859. "Heavy electric conductors." C. Bingham. September 26th.
13,873. "Wood separator for storage-battery plates." E. C. R. Marks (W. Morrison). September 26th.
13,883. "Electrolytic cells for electrolysis of salt, &c." N. Statham. September 26th.
13,884. "Electrolytic cells for manufacture of caustic alkali from sodium chloride." N. Statham. September 26th.
13,885. "Metal electrodes used in depositing and soldering by electric arc." E. H. Jones. September 26th.
13,891. "Sparking plugs for internal-combustion engines." L. S. Clarke. September 26th.
13,918. "Electrode holder for electric furnaces." G. Marriott. September 27th.
13,950. "Transmission of power by alternating currents." J. Kruyswijk. September 27th.
13,951. "Combined interrupter and distributor for battery ignition systems." G. F. Cooke. September 27th.
13,952. "Starting motors and lighting dynamos for motor vehicles." A. G. Benstead & Rotax Motor Accessories Co. September 27th.
13,956. "Electric furnaces." Booth-Hall Co. & H. Wade. September 27th.
13,977. "Electric furnaces." C. Bingham. September 28th.
13,978. "Watertight and weatherproof cases for electrical apparatus, &c." R. L. Stanbrook. September 28th.
13,986. "Electric signal lantern." R. J. Hart. September 28th.
13,990. "Lanterns for incandescent electric lamps." H. T. Wilkinson and Wardle Engineering Co. September 28th.
14,002. "Electric flashlamps." A. F. Brown. September 28th.
14,021. "Manufacture of copper, &c., tubes and articles by electrolysis." T. F. Newman. September 28th.
14,025. "Telephone exchange systems." Western Electric Co. September 28th. (U.S.A., October 11th, 1916.)
14,033. "Electric couplings." H. de la Valette. September 28th. (France, November 3rd, 1916.)
14,035. "Dynamo-electric machines." Enclosed Motor Co. & H. C. E. Jacoby. September 28th.
14,049. "Valve receivers for wireless telegraphy." E. R. Clarke. September 28th.
14,054. "Watertight glands for electric cables." Callender's Cable and Construction Co. and L. Newitt. September 28th.
14,071. "Electric illuminating device for telescope, &c., sights of machine guns." J. Gerber. September 29th.
14,078. "Tilting trunnion combined with roller chain for electric tilting furnaces, tilting kettles, &c." J. H. Twidell. September 29th.
14,092. "Electrical gyroscopes." A. H. Midgley and C. A. Vandervell and Co. September 29th.
14,097. "Sparking plugs." M. J. Willcocks. September 29th.

PUBLISHED SPECIFICATIONS.

1916.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

10,734. Field Magnets for Electric Dynamos and Motors. L. Murphy, Lyon & Wrench. July 29th, 1916. (109,277.)
10,985. Methods and Apparatus for Transmitting and Receiving Sound Waves Through the Ground. R. A. Fessenden. October 7th, 1915. (101,698.)
12,446. Method of Cooling Commutators of Electrical Machines. Thomas Transmission, Ltd., & J. G. P. Thomas. September 2nd, 1916. (109,289.)
12,528. Electric Generators and Motors. J. Shepherd. September 3th, 1916. (Cognate application, 3,155/17.) (109,294.)
12,580. Process of Electrical Precipitation of Suspended Particles from Gases. A. Mond (W. A. Schmidt). September 5th, 1916. (109,297.)
12,583. Metallic Bodies and Process and Apparatus for obtaining the same. J. Pintsch Akt. Ges. September 5th, 1916. (Addition to 16,630/14.) (109,298.)
12,584. Variable-speed Transmission Gear. T. von Zweigbergk. September 5th, 1916. (109,299.)
12,689. Hammers. G. L. Kollock & R. P. Martin. September 7th, 1915. (101,421.)
12,690. Portable Electric Generator Lamps. H. R. van Deventer. July 31st, 1915. (101,422.)
13,342. Method of and Means for Depositing Metal by an Electric Arc. E. H. Jones. September 20th, 1916. (Cognate application, 3,864/17.) (109,321.)